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ENERGY EFFICIENCY/RENEWABLE ENERGY IMPACT IN THE TEXAS EMISSIONS REDUCTION PLAN (TERP)

VOLUME II – TECHNICAL REPORT

Annual Report to the
Texas Commission on Environmental Quality
January 2007 – December 2007

TCEQ

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ENERGY SYSTEMS LABORATORY

Texas Engineering Experiment Station
Texas A&M University System

ENERGY SYSTEMS LABORATORY
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December 19, 2008

Chairman H. S. Buddy Garcia
Texas Council on Environmental Quality
P. O. Box 13087
Austin, TX 78711-3087

Dear Chairman Garcia:

The Energy Systems Laboratory (Laboratory) at the Texas Engineering Experiment Station of the Texas A&M University System is pleased to provide its sixth annual report, "Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP)," as required under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002 (Senate Bill 5, 77R as amended 78 R & 78S).

The Laboratory is required to annually report the energy savings from statewide adoption of the Texas Building Energy Performance Standards in Senate Bill 5 (SB 5), as amended, and the relative impact of proposed local energy code amendments in the Texas non-attainment and near-non-attainment counties as part of the Texas Emissions Reduction Plan (TERP).

Please contact me at (979) 845-1280 should you or any of the TCEQ staff have any questions concerning this report or any of the work presently being done to quantify emissions reduction from energy efficiency and renewable energy measures as a result of the TERP implementation.

Sincerely,

David E. Claridge, Ph.D., P.E.
Director

Enclosure

cc: Commissioner Larry R. Soward
Commissioner Bryan Shaw
Executive Director Glenn Shankle

Disclaimer

VOLUME II – TECHNICAL REPORT

Energy Efficiency / Renewable Energy Impact
In The Texas Emissions Reduction Plan

1 EXECUTIVE SUMMARY

The Energy Systems Laboratory (Laboratory), at the Texas Engineering Experiment Station of the Texas A&M University System, in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002, submits its fifth annual report, Energy Efficiency/Renewable Energy (EE/RE) Impact in the Texas Emissions Reduction Plan to the Texas Commission on Environmental Quality.

The report is organized in three volumes.
- Volume I – Summary Report – provides an executive summary and overview;
- Volume II – Technical Report – provides a detailed report of activities, methodologies and findings;
- Volume III – Technical Appendix – contains detailed data from simulations for each of the counties included in the analysis.

Accomplishments:

1. Energy Code Amendments

The Laboratory was requested by several Council of Governments (COGs) and municipalities to analyze the stringency of several proposed residential and commercial energy code amendments, including: the 2003 and 2006 IECC and the ASHRAE Standards 90.1-2001 and 90.1-2004. Results of the analysis are included in the Vol II Technical Report.

2. Technical Assistance

The Laboratory provided technical assistance to the TCEQ, PUCT, SECO, ERCOT, and several political subdivisions, as well as Stakeholders participating in improving the compliance of the Texas Building Energy Performance Standards (TBEPS). The Laboratory also worked closely with the TCEQ to refine the integrated NOx emissions reduction calculation procedures that provide the TCEQ with a standardized, creditable NOx emissions reduction from energy efficiency and renewable energy (EE/RE) programs, which are acceptable to the US EPA. These activities have improved the accuracy of the creditable NOx emissions reduction from EE/RE initiatives contained in the TERP and have assisted the TCEQ, local governments, and the building industry with effective, standardized implementation and reporting.

3. NOx Emissions Reduction

Under the TERP legislation, the Laboratory must determine the energy savings from energy code adoption and, when applicable, from more stringent local codes or above-code performance ratings, and must report these reductions annually to the TCEQ.

Figure 1 shows the cumulative NOx emissions reduction through 2020 for the electricity and natural gas savings from the various EE/RE programs.

In 2007 the cumulative OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 5.50 tons-NOx/day (21.9%), savings from retrofits to Federal buildings is 0.32 tons-NOx/day (1.2%), savings from furnace pilot light retrofits is 0.32 tons-NOx/day (1.2%), savings from the PUC's TERP and Senate Bill 7 programs is 3.33 tons-NOx/day (12.1%), savings from SECO's TERP program is 0.73 tons-NOx/day (2.9%), electricity savings from green power purchases (wind) are 11.88 tons-NOx/day (47.4%), and savings from residential air conditioner retrofits are 3.27 tons-NOx/day (13.1%). The total NOx emissions reduction from all programs is 25.05 tons-NOx/day.

By 2013 the cumulative NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 2,047 tons-NOx/year (10.9% of the total NOx savings), savings from retrofits to Federal buildings will be 308 tons-NOx/year (1.6%), savings from furnace pilot light retrofits will be 117 tons-NOx/year (0.6%), savings from the PUC's TERP and Senate Bill 7 programs will be 1,801 tons-NOx/year (9.6%), savings from SECO's TERP program will be 341 tons-NOx/year (1.8%), electricity savings from green power purchases (wind) will be 12,534 tons-

NOx/year (66.9%), and savings from residential air conditioner retrofits will be 1,574 tons-NOx/year (8.4%). The total NOx emissions reduction from all programs will be 18,723 tons-NOx/year.

By 2013 the cumulative OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 11.96 tons-NOx/day (20.4%), savings from retrofits to Federal buildings will be 0.81 tons-NOx/day (1.4%), savings from furnace pilot light retrofits will be 0.32 tons-NOx/day (0.8 %), savings from the PUC's TERP and Senate Bill 7 programs will be 4.84 tons-NOx/day (8.3%), savings from SECO's TERP program will be 0.92 tons-NOx/day (1.6%), electricity savings from green power purchases (wind) will be 28.58 tons-NOx/day (48.8%), and savings from residential air conditioner retrofits will be 11.03 tons-NOx/day (18.8%). The total NOx emissions reduction from all programs will be 58.47 tons-NOx/day.

4. Technology Transfer

The Laboratory, along with the TCEQ, is host to the annual Clean Air Through Energy Efficiency (CATEE) conference, which is attended by top experts and policy makers in Texas and from around the country. At the conference the latest educational programs and technology is presented discussed, including efforts by the Laboratory, and others to reduce air pollution in Texas through energy efficiency and renewable energy. These efforts have produced significant success in bringing EE/RE closer to US EPA acceptance in the Texas SIP. The Laboratory will continue to provide superior technology to the State of Texas through such efforts with the TCEQ and the US EPA.

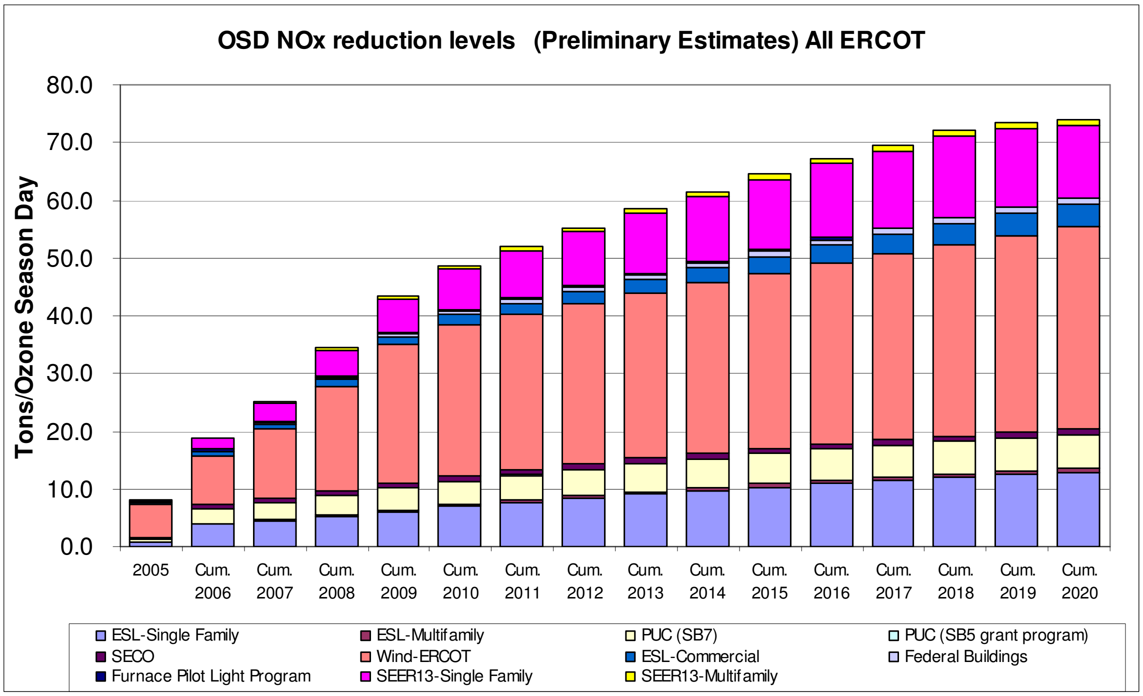

Figure 1: Cumulative OSD NOx Emissions Reduction Projections through 2020.

To accelerate the transfer of technology developed as part of the TERP, the Laboratory has also made presentations at national, state and local meetings and conferences, which includes the publication of peer-reviewed papers. The Laboratory will continue to provide technical assistance to the TCEQ, counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air quality for all Texans.

These efforts have been recognized nationally by the US EPA. In 2007, the Laboratory was awarded a National Center of Excellence on Displaced Emissions Reduction (CEDER) by the US EPA so that these accomplishments could be rapidly disseminated to other states for their use. The benefits of CEDER include: reducing the financial, technical, and administrative costs of determining the emissions reduction from EE/RE measures; continuing to accelerate implementation of EE/RE strategies as a viable clean air effort in Texas and other states; helping other states better identify and prioritize cost-effective clean air strategies from EE/RE;, and communicating the results of quantification efforts through case-studies and a clearinghouse of information.

The Energy Systems Laboratory provides the fifth annual report, Energy Efficiency/Renewable Energy (EE/RE) Impact in the Texas Emissions Reduction Plan (TERP), to the Texas Commission on Environmental Quality (TCEQ) in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002.

If any questions arise, please contact us by phone at 979-458-0675, or by email at SB5info@esl.tamu.edu.

2 ACKNOWLEDGEMENTS

This work has been completed as a fulfillment of the requirements in Texas Health Code, Senate Bill 5, Section 388.003, and through Senate Bill 20, House Bill 2481 and House Bill 2129, which requires the Laboratory to assist TCEQ in quantifying emissions reductions credits from energy efficiency and renewable energy programs, through a contract with the Texas Environmental Research Consortium (TERC). Similarly, selected Code training workshops were funded by the US DOE through the Texas State Energy Conservation Office (SECO). Partial funding on the Texas Climate Vision project, a joint project with the City of Austin was also provided by the US DOE through SECO.

The authors are also grateful for the timely input provided by the following individuals, and agencies: Mr. Art Diem, US EPA, for providing the eGRID database; Mr. Steve Anderson, TCEQ, for contributing helpful insight about improvement to the Emissions Reduction Calculator, and the integrated emissions calculations, and Dr.Akin Olubiyi.

Numerous additional individuals at the Laboratory contributed significantly to this report, including: Dr. Dan Turner, Kyle Marshall, Robert Stackhouse, Jason Cordes, Ms. Sherrie Hughes, Ms. Angie Shafer, Mr. Stephen O'Neal, Mr. Piljae Im, Mr. Soolyeon Cho, Ms. Mini Malhotra, and Mr. Eduardo Rameriez.

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3 OVERVIEW

The Energy Systems Laboratory (Laboratory), at the Texas Engineering Experiment Station of the Texas A&M University System, is pleased to provide our sixth annual report, Energy Efficiency/Renewable Energy Impact in the Texas Emissions Reduction Plan (TERP), to the Texas Commission on Environmental Quality (TCEQ) in fulfillment of its responsibilities under Texas Health and Safety Code Ann. § 388.003 (e), Vernon Supp. 2002. This annual report:

- Provides an estimate of the energy savings and NOx reductions from energy code compliance in new residential construction in all ERCOT counties;
- Provides an estimate of the standardized, cumulative, integrated energy savings and NOx reductions from the TERP programs implemented by the Laboratory, SECO, the PUC and ERCOT in all ERCOT Texas;
- Describes the technology developed to enable the TCEQ to substantiate energy and emissions reduction credits from energy efficiency and renewable energy initiatives (EE/RE) to the U.S. Environmental Protection Agency (US EPA), including the development of a web-based emissions reduction calculator; and
- Outlines progress in advancing EE/RE strategies for credit in the Texas State Implementation Plan (SIP).

The report is organized in three volumes.

Volume I – Summary Report – provides an executive summary and overview;
Volume II – Technical Report – provides a detailed report of activities, methodologies and findings;
Volume III – Technical Appendix – contains detailed data from code-compliant energy simulations for all ERCOT counties in Texas included in the analysis.

3.1 Legislative Background

The TERP was established in 2001 by the 77th Legislature through the enactment of Senate Bill 5 to:

- Ensure that Texas air meets the Federal Clean Air Act requirements (Section 707, Title 42, United States Code); and
- Reduce NOx emissions in non-attainment and near-non-attainment counties through mandatory and voluntary programs, including the implementation of energy efficiency and renewable energy programs (EE/RE).

To achieve the clean air and emissions reduction goals of the TERP, Senate Bill 5 created a number of EE/RE programs for credit in the SIP:

- Adopts statewide Texas Building Energy Performance Standards (TBEPS) as the building energy code for all residential and commercial buildings;
- Provides that a municipality or county may request the Laboratory to determine the energy impact of proposed energy code changes;
- Provides for an annual evaluation by the Public Utility Commission of Texas (PUCT), in cooperation with the Laboratory, of the emissions reduction of energy demand, peak electric loads and the associated air contaminant reductions from utility-sponsored programs established under Senate Bill 5 and utility-sponsored programs established under the electric utility restructuring act (Section 39.905 Utilities Code);
- Establishes a 5% per year electricity reduction goal each year for facilities of political subdivisions in non-attainment and near-non-attainment counties from 2002 through 2007; and
- Requires the Laboratory to report annually to the TCEQ the energy savings (and resultant emissions reduction) from implementation of building energy codes and to identify the municipalities and counties whose codes are more or less stringent than the unamended code.

The 78th Legislature (2003), through HB 1365 and HB 3235, amended TERP to enhance its effectiveness with additional energy efficiency initiatives, and includes:

- Requires the TCEQ to conduct outreach to non-attainment and near-non-attainment counties on the benefits of implementing energy efficiency measures as a way to meet the air quality goals under the federal Clean Air Act;
- Requires the TCEQ develop a methodology for computing emissions reduction from energy efficiency initiatives;
- Authorized a voluntary Energy-Efficient Building Program at the General Land Office (GLO), in consultation with the Laboratory, for the accreditation of buildings that exceed the state energy code requirements by 15% or more;
- Authorizes municipalities to adopt an optional, alternate energy code compliance mechanism through the use of accredited energy efficiency programs determined to be code-compliant by the Laboratory, as well as the US EPA's Energy Star New Homes program; and

- Requires the Laboratory to develop and administer a statewide training program for municipal building inspectors seeking to become code-certified inspectors for enforcement of energy codes.

The 79th Legislature (2005), through SB 20, HB 2481 and HB 2129, amended Senate Bill 5 to enhance its effectiveness by adding the following additional energy efficiency initiatives:

- Requires 5,880 MW of generating capacity from renewable energy technologies by 2015;
- Includes 500 MW from non-wind renewables;
- Requires the PUCT to establish a target of 10,000 megawatts of installed renewable capacity by 2025;
- Requires the TCEQ to develop methodology for computing emissions reduction from renewable energy initiatives and the associated credits;
- Requires the Laboratory to assist the TCEQ in quantifying emissions reduction credits from energy efficiency and renewable energy programs;
- Requires the Texas Environmental Research Consortium (TERC) to contract with the Laboratory to develop and annually calculate creditable emissions reduction from wind and other renewable energy resources for the state's SIP; and
- Requires the Laboratory to develop at least three alternative methods for achieving a 15 % greater potential energy savings in residential, commercial and industrial construction.

The 80th Legislature (2007), through SB 12, and HB 3693 amended Senate Bill 5 to enhance its effectiveness by adding the following additional energy efficiency initiatives:

- Requires the Laboratory to provide written recommendations to the State Energy Conservation Office (SECO) about whether or not the energy efficiency provisions of latest published edition of the International Residential Code (IRC) or the International Energy Conservation Code (IECC) are equivalent to or better than the energy efficiency and air quality achievable under the editions adopted under the 2001 IRC/IECC. The Laboratory shall make its recommendations no later than six months after publication of new editions at the end of each three-year code development cycle of the International Residential Code and the International Energy Conservation Code.
- Requires the Laboratory to consider comments made by persons who have an interest in the adoption of the energy codes in the recommendations made to SECO.
- Requires the Laboratory to develop a standardized report format to be used by providers of home energy ratings, including different report formats for rating newly constructed residences from those for existing residences. The form must be designed to give potential buyers information on a structure's energy performance, including: insulation; types of windows; heating and cooling equipment; water heating equipment; additional energy conserving features, if any; results of performance measurements of building tightness and forced air distribution; and an overall rating of probable energy efficiency relative to the minimum requirements of the International Energy Conservation Code or the energy efficiency chapter of the International Residential Code, as appropriate.
- Encourages the Laboratory to cooperate with an industry organization or trade association to: develop guidelines for home energy ratings; provide training for individuals performing home energy ratings and providers of home energy ratings; and provide a registry of completed ratings for newly constructed residences and residential improvement projects for the purpose of computing the energy savings and emissions reduction benefits of the home energy ratings program.
- Requires the Laboratory to include information on the benefits attained from this program in an annual report to the commission.

3.2 Laboratory Funding for the TERP

The Laboratory received $182,000 in FY 2002; $285,000 in FY 2003; $950,421 in FY 2004; $952,019 in FY 2005, FY 2006 and FY 2007. The Laboratory has also supplemented these funds with competitively awarded Federal grants to provide the needed statewide training for the new mandatory energy codes and to provide technical assistance to cities and counties in helping them implement adoption of the legislated energy efficiency codes, and an award from the US EPA in the Spring of 2007 to establish a Center of Excellence for the Determination of Emissions Reduction (CEDER) which will help to enhance the EE/RE emissions calculations.

3.3 Accomplishments Since January 2007

Since January of 2007, the Laboratory accomplished the following:

- Calculated energy and resultant NOx reductions from implementation of the Texas Building Energy Performance Standards (IECC/IRC codes) to new residential and commercial construction for all non-attainment and near-non-attainment counties;

- Enhanced the web-based "Emissions Reduction Calculator - eCalc" for determining emissions reduction from energy efficiency improvements in residential and commercial construction, municipal projects and renewable energy projects;
- Enhanced the Laboratory's IECC/IRC Code-Traceable Test Suite for determining emissions reduction due to code and above-code programs;
- Continued development and testing of key procedures for validating simulations of building energy performance;
- Provided energy code training workshops, including: residential, commercial IECC/IRC energy code training sessions, code-compliant software sessions, ASHRAE Standard 62.1 sessions, and ASHRAE Standard 90.1 workshops throughout the State of Texas;
- Maintained and updated the Laboratory's Texas Emissions Reduction Plan (TERP) website;
- Maintained a builder's residential energy code Self-Certification Form (Ver.1.3) for use by builders outside municipalities;
- Responded to hundreds of phone and email inquiries on code implementation and verification issues;
- Analyzed the stringency of several residential and commercial energy codes, including the 2006 IECC and ASHRAE Standard 90.1-2001 and Standard 90.1-2004;
- Hosted the Clean Air Through Energy Efficiency (CATEE) Conference in December 2007, in San Antonio, Texas. Conference sessions included key talks by the TCEQ, EPA, DOE and the Laboratory about quantifying emissions reduction from EE/RE opportunities and guidance on key energy efficiency and renewable energy topics;
- Provided technical assistance to the TCEQ regarding specific issues, including:
  - Enhancement of the standardized, integrated NOx emissions reduction reporting procedures[1] to the TCEQ for ESL, PUCT, SECO and ERCOT EE/RE projects;
  - Enhancement of the procedures for weather normalizing NOx emissions reduction from power provided by wind energy providers to base-year calculations;
  - Quantified emissions reduction from the new, Federally-mandated SEER 13 air conditioner standard (starting in January 2006).
- Enhanced the web-based emissions reduction calculator, including:
  - Expanded the emissions reduction calculator to include all counties in ERCOT;
  - Gathered, cleaned and posted weather data archive for 17 NOAA stations in Texas;
  - Expanded emissions reduction to include SEER 13 air conditioners;
  - Continued the enhancement of the new computer architecture to allow for synchronous calculations, user accounts, and code-compliance;
- Developed 15% above code recommendations for residential buildings;
- Developed 15% above code recommendations for commercial and industrial buildings; and
- Continued the development of verification procedures, including:
  - Completion of calibrated simulation of a high-efficiency office building in Austin, TX;
  - Worked towards a calibrated simulation of an office building;
  - Worked towards a calibrated simulation of a K-12 school; and
  - Completed the calibrated simulation of a Habitat for Humanities residence.

3.4 Technology Transfer

To accelerate the transfer of technology developed as part of the TERP program, the Laboratory:

- Delivered "Statewide Air Emissions Calculations from Wind and Other Renewables," to the Texas Commission on Environmental Quality in August 2007.
- Continued development of a method to predict on-site wind speeds using Artificial Neural Networks (ANN) and developed improvements to the daily modeling procedures using ANN-derived hourly wind speeds.
- Applied previously developed degradation analysis to determine if degradation could be observed in the measured power from Texas wind farms.
- Applied previously developed empirical curtailment analysis of the measured power production from a wind farm and applied to the Indian Mesa wind farm.
- Updated previously developed database of other renewable projects in Texas, including: solar photovoltaic, geothermal, hydroelectric, and Landfill Gas-fired Power Plants.
- Applied previously developed estimation techniques for hourly solar radiation from limited data sets.
- Along with the TCEQ and the US EPA, is host to the annual Clean Air Through Energy Efficiency (CATEE) Conference attended by top Texas experts and policy makers and national experts.

[1] These procedures are currently under review by the USDOE, through the National Renewable Energy Laboratory (NREL).

- Continued the National Center of Excellence on Displaced Emissions Reduction (CEDER) by the US EPA. The benefits of CEDER include:
  - reducing the financial, technical, and administrative costs of determining the emissions reduction from EE/RE measures;
  - continuing to accelerate implementation of EE/RE strategies as a viable clean air effort in Texas and other states;
  - helping other states identify and prioritize cost-effective clean air strategies from EE/RE; and;
  - communicating the results of quantification efforts through case-studies and a clearinghouse of information.

In addition to the tasks listed above, the Laboratory delivered presentations regarding the TERP related work, including:

- Presentation to the American Waste Management Association (AWMA) meeting, Austin, Texas, February 2007.
- Presentation to Baylor University, Waco, Texas, March 2007.
- Presentation to the U.S. Congress for ASHRAE Tech Briefing, Washington, D.C. March 2007.
- Presentation to the ENGR 101 class, Texas A&M University, April 2007.
- Presentation, via conference call, to EPRI, April 2007.
- Presentation at ASHRAE Carbon Toolkit Workshop, March, 2007 (by phone).

Presentation of four papers at the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates, in San Antonio, Texas, December 2007, including:

- Baltazar-Cervantes, J.C., Im, P., Haberl, J., Liu, Z., Mukhopadhyay, Culp, C., J., Kim, S., Gilman, D., Yazdani, B. 2007. "A Methodology for Calculating Integrated Emissions Reductions From Energy Efficiency and Renewable Energy (EE/RE) Programs Across State Agencies in Texas", *Proceedings of the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates,* Texas A&M University, San Antonio, Texas, published on CD ROM (December).
- Malhotra, M., Mukhopadhyay, J., Liu, Z., Culp, C., Haberl, J., Yazdani, B. 2007. "Recommendaitons for 15% Above Code Energy Efficiencyc Measures for Single-family Residences", *Proceedings of the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates,* Texas A&M University, San Antonio, Texas, published on CD ROM (December).
- Cho, S., Mukhopadhyay, J., Culp, C., Haberl, J., Yazdani, B. 2007. "Recommendaitons for 15% Above Code Energy Efficiency Measures for Commercial Buildings", *Proceedings of the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates,* Texas A&M University, San Antonio, Texas, published on CD ROM (December).
- Morgan, R., Gilman, D., Mukhopadhyay, J., Marshall, K., Stackhouse, R., Cordes, J., Liu, Z., Montgomery, C., Haberl, J., Culp, C., Yazdani, B. 2007. "Development of a Residential Code-compliant Calculator for the Texas Climate Vision Project", *Proceedings of the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates,* Texas A&M University, San Antonio, Texas, published on CD ROM (December).

Presentation of two papers at the International Conference for Enhanced Building Operation, San Francisco, California, October 2007, including:

- Liu, Z., Haberl, J., Baltazar-Cervantes, J.C., Subbarao, K., Culp, C., Yazdani, B. 2007. "A Methodology for Calculating Emissions Reductions From Renewable Energy Programs and it Application to the Wind Farms in the Texas ERCOT Region", *Proceedings of the 8th International Conference for Enhanced Building Operation*", San Francisco, CA, published on CD ROM (October).
- Baltazar-Cervantes, J.C., Haberl, J., Culp, C., Yazdani, B., Gilman, D. 2007. "Procedures for the Integration of Complete Year Texas Weather Data Files for eCalc Emissions Reduction Calculator", *Proceedings of the 8th International Conference for Enhanced Building Operation*", San Francisco, CA, published on CD ROM (October).

The Laboratory has and will continue to provide leading-edge technical assistance to the TCEQ, counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air quality for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP. These activities were designed to more accurately calculate the creditable NOx emissions reduction from EE/RE initiatives contained in the TERP and to assist the TCEQ, local governments, and the building industry with standardized, effective implementation and reporting.

3.5 Energy and NOx Reductions from New Residential and Commercial Construction, including furnace pilot light savings and residential air conditioner retrofits.

State adoption of the energy efficiency provisions of the International Residential Code (IRC) and International Energy Conservation Code (IECC) became effective September 1, 2001. The Laboratory has developed and delivered training to assist municipal inspectors to become certified energy inspectors. The Laboratory also supported code officials with guidance on interpretations as needed. This effort, based on a requirement of HB 3235, 78th Texas Legislature, supports a more uniform interpretation and application of energy codes throughout the state. In general, the State is experiencing a true market transformation from low energy efficiency products to high energy efficiency products. These include: Low Solar Heat Gain windows, higher efficiency appliances, high efficiency air conditioners and heat pumps, increased insulation, lower thermal loss ducts and in builder participation in “above-code” code programs such as Energy Star New Homes, which previously had no state baseline and almost no participation.

In 2007 the cumulative annual electricity savings[2] from code-compliant residential and commercial construction is calculated to be 1,440,885 MWh/year (11.4% of the total electricity savings), savings from furnace pilot light retrofits is 2,548,904 MBtu/year, and savings from residential air conditioner retrofits[3] is 677,171 MWh/year (5.4%).

In 2007 the cumulative OSD electricity savings from code-compliant residential and commercial construction is calculated to be 7,979 MWh/day (21.3%), savings from furnace pilot light retrofits is 6,983 MBtu/day, and savings from residential air conditioner retrofits are 4,803 MWh/day (12.8%).

By 2013 the cumulative annual electricity savings from code-compliant residential and commercial construction is calculated to be 2,930,748 MWh/year (10.2% of the total electricity savings), savings from furnace pilot light retrofits will remain at 2,548,904 MBtu/year, and savings from residential air conditioner retrofits[4] will be 2,286,233 MWh/year (7.9%).

By 2013 the cumulative OSD electricity savings from code-compliant residential and commercial construction is calculated to be 17,499 MWh/day (19.7%), savings from furnace pilot light retrofits will remain at 6,893 MBtu/day, and savings from residential air conditioner retrofits will be 16,216 MWh/day (18.3%).

In 2007 the cumulative annual NOx emissions reduction[5] from code-compliant residential and commercial construction is calculated to be 1,014 tons-NOx/year (12.2% of the total NOx savings), savings from furnace pilot light retrofits is 117 tons-NOx/year (1.4%), and savings from residential air conditioner retrofits is 466 tons-NOx/year (5.6%).

In 2007 the cumulative OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 5.50 tons-NOx/day (21.9%), savings from furnace pilot light retrofits is 0.32 tons-NOx/day (1.2%), and savings from residential air conditioner retrofits are 3.27 tons-NOx/day (13.1%).

By 2013 the cumulative NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 2,047 tons-NOx/year (10.9% of the total NOx savings), savings from furnace pilot light retrofits will be 117 tons-NOx/year (0.6%), and savings from residential air conditioner retrofits will be 1,574 tons-NOx/year (8.4%).

By 2013 the cumulative OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 11.96 tons-NOx/day (20.4%), savings from furnace pilot light retrofits will be 0.32 tons-NOx/day (0.8 %), and savings from residential air conditioner retrofits will be 11.03 tons-NOx/day (18.8%).

3.6 Integrated NOx Emissions Reductions Reporting Across State Agencies

Beginning in 2005, the Laboratory worked with the TCEQ to develop a standardized, integrated NOx emissions reduction across state agencies implementing EE/RE programs so that the results can be evaluated consistently. As

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[2] This includes the savings from 2001 through 2007.
[3] This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.
[4] This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.
[5] These NOx emissions reduction were calculated with the US EPA’s 2007 eGRID for annual (25% capacity factor) and Ozone Season Day OSD.

required by the legislation, the TCEQ receives reports: from the Laboratory on savings from code compliance and renewables; from the Laboratory, in cooperation with the Electric Reliability Council of Texas (ERCOT), on the savings from electricity generated from wind power; from the Public Utilities Commission of Texas (PUCT) on the impacts of the utility-administered programs designed to meet the mandated energy efficiency goals of SB7 and SB5; and from the State Energy Conservation Office (SECO) on the impacts of energy conservation in state agencies and political subdivisions.

The total cumulative annual and OSD electricity savings for all the different programs in the integrated format was calculated using the adjustment factors for 2001 through 2020. NOx emissions reduction from the electricity and natural gas savings for the annual and OSD for all the programs in the integrated format were calculated.

In 2007 the cumulative annual electricity savings[6] from code-compliant residential and commercial construction is calculated to be 1,440,885 MWh/year (11.4% of the total electricity savings), savings from retrofits to Federal buildings is 159,415 MWh/year (1.3%), savings from furnace pilot light retrofits is 2,548,904 MBtu/year, savings from the PUC's Senate Bill 5 and Senate Bill 7 programs is 1,598,054 MWh/year (12.7%), savings from SECO's Senate Bill 5 program is 353,701 MWh/year (2.8%), electricity savings from green power purchases (wind) is 8,362,335 MWh/year (66.4%), and savings from residential air conditioner retrofits[7] is 677,171 MWh/year (5.4%). The total savings from all programs is 12,591,561 MWh/year.

In 2007 the cumulative OSD electricity savings from code-compliant residential and commercial construction is calculated to be 7,979 MWh/day (21.3%), savings from retrofits to Federal buildings is 437 MWh/day (1.2%), savings from furnace pilot light retrofits is 6,983 MBtu/day, savings from the PUC's Senate Bill 5 and Senate Bill 7 programs is 4,378 MWh/day (11.7%), savings from SECO's Senate Bill 5 program is 969 MWh/day (2.6%), electricity savings from green power purchases (wind) are 18,856 MWh/day (50.4%), and savings from residential air conditioner retrofits are 4,803 MWh/day (12.8%). The total savings from all programs is 37,421 MWh/day, which would be a 1,559 MW average hourly load reduction during the OSD period.

By 2013 the cumulative annual electricity savings from code-compliant residential and commercial construction is calculated to be 2,930,748 MWh/year (10.2% of the total electricity savings), savings from retrofits to Federal buildings will be 402,732 MWh/year (1.4%), savings from furnace pilot light retrofits will remain at 2,548,904 MBtu/year, savings from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 2,615,377 MWh/year (9.1%), savings from SECO's Senate Bill 5 program will be 447,285 MWh/year (1.5%), electricity savings from green power purchases (wind) will be 20,112,716 MWh/year (69.8%), and savings from residential air conditioner retrofits[8] will be 2,286,233 MWh/year (7.9%). The total savings from all programs will be 28,802,074 MWh/year.

By 2013 the cumulative OSD electricity savings from code-compliant residential and commercial construction is calculated to be 17,499 MWh/day (19.7%), savings from retrofits to Federal buildings will be 1,103 MWh/day (1.2%), savings from furnace pilot light retrofits will remain at 6,893 MBtu/day, savings from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 7,166 MWh/day (8.1%), savings from SECO's Senate Bill 5 program will be 1,225 MWh/day (1.4%), electricity savings from green power purchases (wind) will be 45,351 MWh/day (51.2%), and savings from residential air conditioner retrofits will be 16,216 MWh/day (18.3%). The total savings from all programs will be 88,560 MWh/day, which would be a 3,690 MW average hourly load reduction during the OSD period.

In 2007 the cumulative annual NOx emissions reduction[9] from code-compliant residential and commercial construction is calculated to be 1,014 tons-NOx/year (12.2% of the total NOx savings), savings from retrofits to Federal buildings is 122 tons-NOx/year (1.4%), savings from furnace pilot light retrofits is 117 tons-NOx/year (1.4%), savings from the PUC's Senate Bill 5 and Senate Bill 7 programs is 1,125 tons-NOx/year (13.5%), savings from SECO's Senate Bill 5 program is 270 tons-NOx/year (3.2%), electricity savings from green power purchases (wind) is 5,211 tons-NOx/year (62.6%), and savings from residential air conditioner retrofits is 466 tons-NOx/year (5.6%). The total NOx emissions reduction from all programs is 8,326 tons-NOx/year.

In 2007 the cumulative OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 5.50 tons-NOx/day (21.9%), savings from retrofits to Federal buildings is 0.32 tons-NOx/day (1.2%), savings from furnace pilot light retrofits is 0.32 tons-NOx/day (1.2%), savings from the PUC's Senate Bill 5 and Senate Bill 7 programs is 3.33 tons-NOx/day (12.1%), savings from SECO's Senate Bill 5 program is 0.73 tons-NOx/day

[6] This includes the savings from 2001 through 2007.
[7] This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.
[8] This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.
[9] These NOx emissions reduction were calculated with the US EPA's 2007 eGRID for annual (25% capacity factor) and Ozone Season Day OSD.

(2.9%), electricity savings from green power purchases (wind) are 11.88 tons-NOx/day (47.4%), and savings from residential air conditioner retrofits are 3.27 tons-NOx/day (13.1%). The total NOx emissions reduction from all programs is 25.05 tons-NOx/day.

By 2013 the cumulative NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 2,047 tons-NOx/year (10.9% of the total NOx savings), savings from retrofits to Federal buildings will be 308 tons-NOx/year (1.6%), savings from furnace pilot light retrofits will be 117 tons-NOx/year (0.6%), savings from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 1,801 tons-NOx/year (9.6%), savings from SECO's Senate Bill 5 program will be 341 tons-NOx/year (1.8%), electricity savings from green power purchases (wind) will be 12,534 tons-NOx/year (66.9%), and savings from residential air conditioner retrofits will be 1,574 tons-NOx/year (8.4%). The total NOx emissions reduction from all programs will be 18,723 tons-NOx/year.

By 2013 the cumulative OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 11.96 tons-NOx/day (20.4%), savings from retrofits to Federal buildings will be 0.81 tons-NOx/day (1.4%), savings from furnace pilot light retrofits will be 0.32 tons-NOx/day (0.8 %), savings from the PUC's Senate Bill 5 and Senate Bill 7 programs will be 4.84 tons-NOx/day (8.3%), savings from SECO's Senate Bill 5 program will be 0.92 tons-NOx/day (1.6%), electricity savings from green power purchases (wind) will be 28.58 tons-NOx/day (48.8%), and savings from residential air conditioner retrofits will be 11.03 tons-NOx/day (18.8%). The total NOx emissions reduction from all programs will be 58.47 tons-NOx/day.

Figure 2 shows the cumulative NOx emissions reduction through 2020 for the electricity and natural gas savings from all TERP programs reporting to the TCEQ. Table 1 provides the details regarding the annual degradation, transmission and distribution losses, discount factors and growth factors that were used in the analysis[10]. Additional details of the analysis are reported in Volume III of this report.

Table 1: Adjustment Factors used for the Calculation of the Annual and OSD NOx Savings for the Different Programs.

	ESL-Single Family[16]	ESL-Multifamily[16]	ESL-Commercial[16]	Federal Buildings[15]	Furnace Pilot Light Program[15]	PUC (SB7)[15]	PUC (SB5 Grant Program)[15]	SECO[15]	Wind-ERCOT[8]	SEER13 Single Family	SEER13 Multifamily
Annual Degradation Factor [11]	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	0.00%	5.00%	5.00%
T&D Loss [9]	7.00%	7.00%	7.00%	7.00%	0.00%	7.00%	7.00%	7.00%	0.00%	7.00%	7.00%
Initial Discount Factor [12]	20.00%	20.00%	20.00%	20.00%	20.00%	25.00%	25.00%	60.00%	25.00%	20.00%	20.00%
Growth Factor	3.25%	1.54%	3.25%	0.00%	0.00%	0.00%	0.00%	0.00%	Actual Rates	N.A.	N.A.
Weather Normalized	Yes	Yes	Yes	No	No	No	No	No	See note 7	Yes	Yes

[10] These factors were determined by TCEQ.

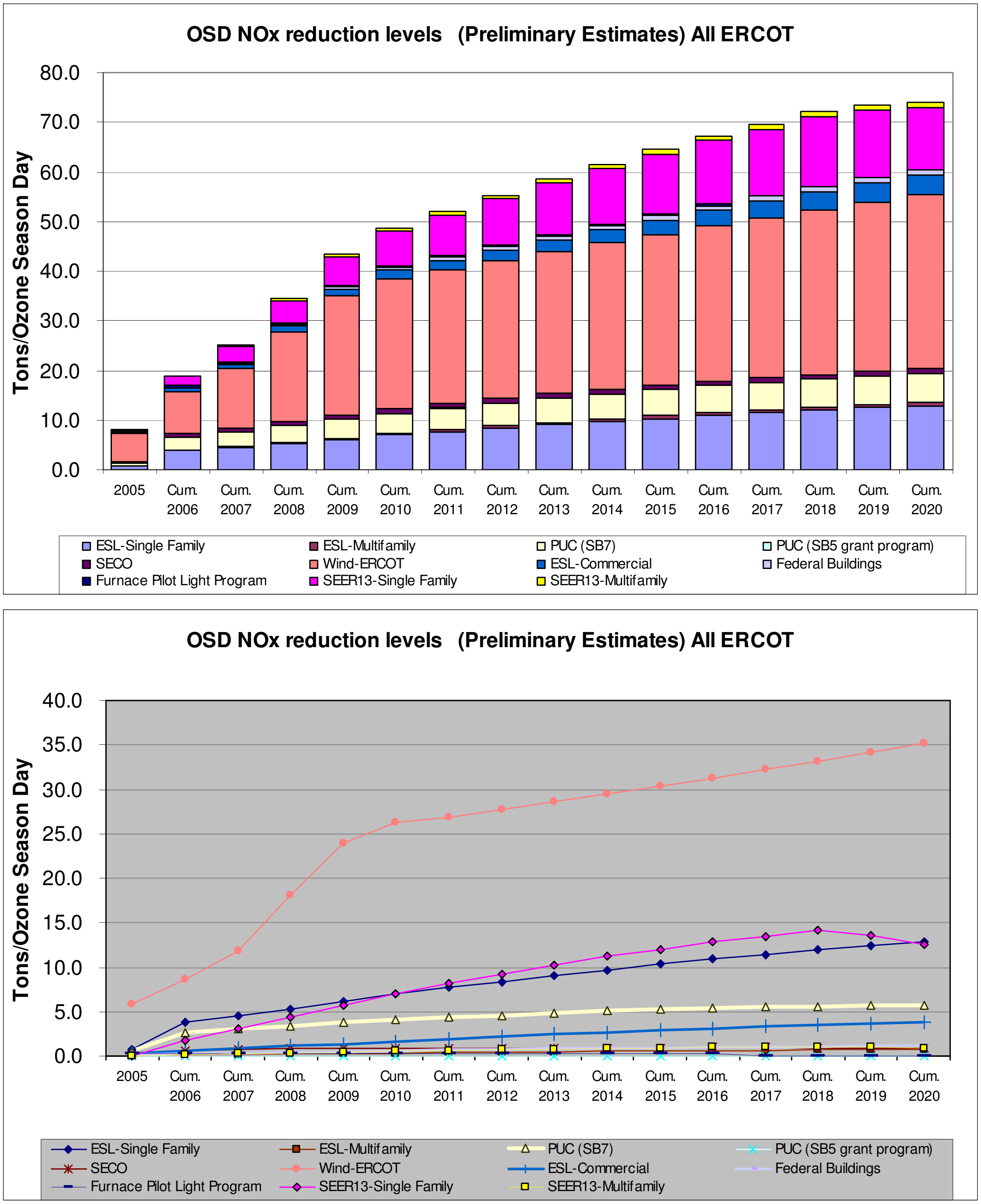


Figure 2: Cumulative OSD NOx Emissions Reduction Projected through 2020.

3.7 Technology for Calculating and Verifying Emissions Reduction from Energy Used in Buildings

In 2004 and 2005, the Laboratory developed a web-based Emissions Reduction Calculator, known as "*eCalc*," which contains the underlying technology for determining NOx emissions reduction from power plants that generate the electricity for the user[11]. The emissions reduction calculator is being used to calculate emissions reduction for consideration for SIP credits from energy efficiency and renewable energy programs in the TERP.

In 2007, the Laboratory enhanced the calculator to provide additional functions and usability, including:

- Enhanced the Laboratory's IECC/IRC Code-Traceable Test Suite for determining emissions reduction due to code and above-code programs;
- Enhanced web-based emissions calculator, including:
  - Use of the calculator to determine 15% above code residential and commercial options.
  - Gathered, cleaned and posted weather data archive for 17 NOAA stations;
  - Performed comparative testing of the calculator vs other, non-web-based simulation programs;
  - Developed and tested radiant barrier simulation;
  - Using the web-based emissions calculator, developed the specially-designed Texas Climate Vision calculator for the City of Austion;
- Continued the development of verification procedures, including:
  - Completed the calibrated simulation of a high-efficiency office building in Austin, Texas;
  - Continued work to develop a calibrated simulation of an office building in College Station; and
  - Continued work to develop a calibrated simulation of a K-12 school in College Station;

3.8 Planned Focus for 2007/2008

In FY 2008, the Energy Systems Laboratory is continuing its cooperative efforts with the TCEQ, PUCT, SECO, US EPA and others to ensure EE/RE measures remain a cost-effective solution to clean air, and continue to support the energy efficiency and renewable energy opportunities of the TERP. In FY 2008 the Laboratory team will:

- Continue to assist the TCEQ to obtain SIP credits from energy efficiency and renewable energy using the Laboratory's Emissions Reduction Calculator technology;
- Verify, document and report energy efficiency and renewable energy savings in all TERP EE/RE programs for the SIP in each non-attainment and near-non-attainment county using the TCEQ/US EPA approved technology;
- Assist the PUCT with determining emissions reduction credits from energy efficiency programs funded by SB 7 and SB 5;
- Assist political subdivisions and Councils of Governments with calculating emissions reduction from local code changes and voluntary EE/RE programs reported to SECO for SIP inclusion;
- Continue to develop additional low-cost methods and techniques to implement 15% above code energy efficiency in low-priced and moderately-priced residential housing and commercial construction;
- With support from the US DOE and SECO, continue the development of a web-based code-compliance calculator in Austin, Texas (TCV project), and expand the use of such a calculator in other areas of Texas (i.e., the International Code Compliance Calculator – ICCC for Texas);
- Continue to develop creditable procedures for calculating NOx emissions reduction from green renewable technologies, including wind power, solar energy and geothermal energy systems;
- Continue development of the standardized, integrated NOx emissions reduction methodologies for calculating and reporting NOx reductions, including a unified database framework for required reporting to the TCEQ of potentially creditable measures from the ESL, PUCT, and SECO TERP initiatives;
- Complete the analysis of the stringency of several residential and commercial energy codes, including ASHRAE Standard 90.1-2004; and 90.1-2007, and the 2006 IECC; and
- With the assistance of the TCEQ and EPA, expand all analysis to include all counties in Texas;
- With the assistance of the US EPA, expand the analysis to include new base year calculations for eGRID;
- Continue its role as the National Center of Excellence on Displaced Emissions Reduction (CEDER) as designated by the US EPA; and
- Host the 2008 Clean Air Through Energy Efficiency (CATEE) conference to be held in Dallas, Texas.

The Laboratory will continue to provide technical assistance to the TCEQ, counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air quality for all Texans.

3.9 Code Adoption

State adoption of the Residential Code energy provisions and International Energy Conservation Code became effective September 1, 2001, although anecdotal evidence in the form of telephone queries reported observations and training

[11] eCalc reports NOx, SOx and CO2 emissions reduction from the US EPA eGRID database for power providers in the ERCOT region.

workshop interactions through 2002 and, to a lesser extent, 2003, indicated a rolling start rather than an overnight implementation.

Our emphasis in 2007 has been on the continued delivery of training aimed at assisting municipal inspectors to become certified energy inspectors (in one of several designations maintained by the International Energy Code Council) and supporting code officials with guidance on interpretations as needed. This effort, begun in 2003 and based on a requirement of HB 3235 of the 78th Texas Legislature, is designed to support a more uniform interpretation and application of energy codes throughout the state. In general, the State has enjoyed a true market transformation in the supply of certain products, such as Low Solar Gain windows, and in builder participation in "above-code" code programs, which previously had no state baseline and almost no participation.

3.9.1 Technology for Calculation and Verifying Emissions Reductions from Energy Used in Buildings

In 2004, the Laboratory developed a web-based Emissions Reduction Calculator, know as "eCalc," which contains the underlying technology for determining emissions reductions from power plants that generate the electricity for the user. The Emissions Reduction Calculator is being used to calculate emissions reductions for consideration for SIP credits from energy efficiency programs in the TERP. The TCEQ and the US EPA continue to review the Laboratory's technology and recent refinements for estimating NOx emissions reductions from additional energy efficiency and renewable energy (EE/RE) measures.

In 2007, the Laboratory continued to enhance the calculator to provide additional functions and usability. This enhanced engineering analysis software addressed major challenges:

- How to quantify and validate the persistence of energy savings from EE/RE energy measures.
- How to transform electricity reductions into spatial (location) and temporal (time-of-day) distributions of emissions reductions from electric utility power plants.
- How to quantify cumulative, multi-year emissions reductions that account for reduced emissions from the associated power plants according to the US EPA's eGRID database using the specially prepared 2007 version of eGRID.
- How to weather-normalize NOx emissions estimates for renewable sources, such as wind and solar.

In 2007, the Laboratory's Emissions Reduction Calculator used a specially prepared 2007 version of the US EPA's eGRID database to identify where emissions are produced. To date, the Laboratory has enhanced the emissions calculator by:

- expanding the capabilities to include all counties in ERCOT; including the collection and assembly of weather from 1999 to the present from 17 NOAA weather stations;
- initiating the expansion of the calculator to be able to analyze energy efficiency improvement to K-12 schools;
- enhancing the underlying computer platform for the calculator;
- verifying the calculator against other RESNET certified calculators;
- adding a radiant barrier and duct model to the calculator;
- added calculations to account for the increased energy savings from the new SEER 13 air conditioners, introduced in 2006 as part of the new Federal regulations, and
- developing verification procedures for the savings currently calculated and reported by the Laboratory, including calibrated simulations for a two office buildings, one residence and one K-12 school.

3.9.2 Evaluation of Additional Technologies for Reducing Energy Use in Existing Buildings

The Laboratory provided technical assistance to the TCEQ, the PUCT, SECO and ERCOT, as well as Stakeholders participating in the Energy Code and Renewables programs.

- In 2005, the Laboratory worked closely with the TCEQ to develop an integrated NOx emissions reductions calculation that provided the TCEQ with a creditable NOx emissions reductions from energy efficiency and renewable energy (EE/RE) programs reported to the TCEQ in 2005 by the Laboratory, PUCT, SECO, and ERCOT (i.e., wind).
- At the request of the TCEQ, the Laboratory also developed procedures for quantifying NOx emissions reductions from wind turbines that includes weather normalization and the quantification of NOx emissions reductions from the new Federal regulations for SEER 13 air conditioners.
- At the request of the North Central Texas Council of Governments, the Laboratory developed recommendations for adopting the 2006 IECC, which are based, in part, on several meetings held with the

SB5 stakeholders to determine how adopt the 2006 IECC, which was determined by the Laboratory to be less stringent than the 2000/2001 IECC for many counties and housing types in Texas.

3.10 Planned Focus for 2007/2008

In FY 2008, the Energy Systems Laboratory will continue in its cooperative efforts with the TCEQ, PUCT, SECO, US EPA and others to ensure EE/RE measures remain a cost-effective solution to clean air, and continue to support the energy efficiency and renewable energy opportunities of the TERP. The Laboratory team will:

- Assist the TCEQ to obtain SIP credits from energy efficiency and renewable energy using the Laboratory's Emissions Reduction Calculator technology;
- Verify, document and report energy efficiency and renewable energy savings in all TERP EE/RE programs for the SIP in each non-attainment and affected county using the TCEQ/US EPA approved technology;
- Assist the PUCT with determining emissions reductions credits from energy efficiency programs funded by SB 7 and SB 5;
- Assist political subdivisions and Councils of Governments with calculating emissions reductions from local code changes and voluntary EE/RE programs for SIP inclusion;
- Continue to refine the cost-effective techniques to implement 15% above code energy efficiency in low-priced and moderately-priced residential housing;
- Continue to refine the cost-effective methods and techniques to implement 15% above code energy efficiency in low-priced and moderately-priced commercial buildings;
- Continue to develop creditable procedures for calculating NOx emissions reductions from green renewable technologies, including wind power, solar energy and geothermal energy systems;
- Continue development of well-documented, integrated Nox emissions reductions methodologies for calculating and reporting NOx reductions, including a unified database framework for required reporting to TCEQ of potentially creditable measures from the ESL, PUCT, and SECO SB 5 initiatives;
- Upon request, provide written recommendations to the State Energy Conservation Office (SECO) about whether or not the energy efficiency provisions of latest published edition of the International Residential Code (IRC), or the International Energy Conservation Code (IECC), are equivalent to or better than the energy efficiency and air quality achievable under the editions adopted under the 2001 IRC/IECC. This will consider comments made by persons who have an interest in the adoption of the energy codes in the recommendations made to SECO.
- Develop a standardized report format to be used by providers of home energy ratings, including different report formats for rating newly constructed residences from those for existing residences.
- Continue to cooperate with an industry organization or trade association to: develop guidelines for home energy ratings; provide training for individuals performing home energy ratings and providers of home energy ratings; and provide a registry of completed ratings for newly constructed residences and residential improvement projects for the purpose of computing the energy savings and emissions reductions benefits of the home energy ratings program.
- Include all benefits attained from this program in an annual report to the commission.

The Laboratory has and will continue to provide leading-edge technical assistance to counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering emissions and improving the air for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP.

4 INTRODUCTION

4.1 Background

In 2001, the Texas Legislature adopted the Texas Emissions Reduction Plan, identifying thirty-eight counties in Texas where a focus on air quality improvements was deemed critical to public health and economic growth. Sixteen were designated by the US EPA as non-attainment areas, twenty-two others were designated by TERP as affected areas. These areas are shown on the map in Figure 3 as non-attainment (dark-shaded) and affected (shaded). The sixteen counties designated as non-attainment counties include: Brazoria, Chambers, Collin, Dallas, Denton, El Paso, Fort Bend, Hardin, Harris, Jefferson, Galveston, Liberty, Montgomery, Orange, Tarrant, and Waller Counties. The twenty-two counties designated as affected counties include: Bastrop, Bexar, Caldwell, Comal, Ellis, Gregg, Guadalupe, Harrison, Hays, Johnson, Kaufman, Nueces, Parker, Rockwall, Rusk, San Patricio, Smith, Travis, Upshur, Victoria, Williamson, and Wilson County. In 2003, three additional counties were classified as affected counties, including: Henderson, Hood and Hunt counties, bringing the total to forty-one counties (sixteen non-attainment and twenty-five affected counties).

These counties represent several geographic areas of the state, which have been assigned to different climate zones by the 2001 IECC[12] as shown in Figure 4, based primarily on Heating Degree Days (HDD). These include climate zone 5 or 6 (i.e., 2,000 to 2,999 HDD_{65}) for the Dallas-Ft. Worth and El Paso areas, and climate zones 3 and 4 (i.e., 1,000 to 1,999 HDD_{65}) for the Houston-Galveston-Beaumont-Port Author-Brazoria areas. Also shown on Figure 4 are the locations of the various weather data sources, including the Typical Meteorological Year (TMY2) (NREL 1995) stations, the Weather Year for Energy Calculations (WYEC2) (Stoffel 1995) weather stations, the National Weather Service weather stations, (NWS) (NOAA 1993) weather stations, the ASHRAE 90.1 1989 weather locations[13], the ASHRAE 90.1 1999 weather locations, the solar stations measured by the National Renewable Energy Laboratory (NREL)[14], the solar stations measured by the TCEQ[15], and F-CHART and PV F-CHART weather locations[16].

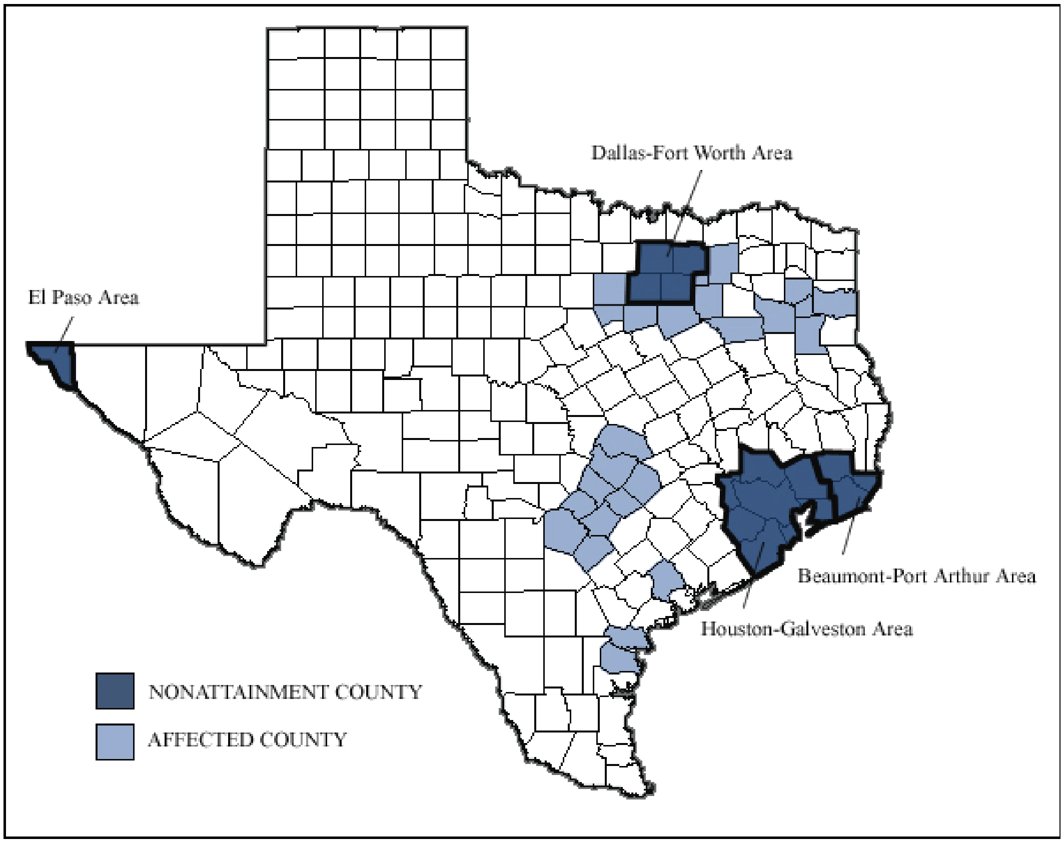


Figure 3: US EPA Non-attainment (dark shade) and affected counties (light shade).

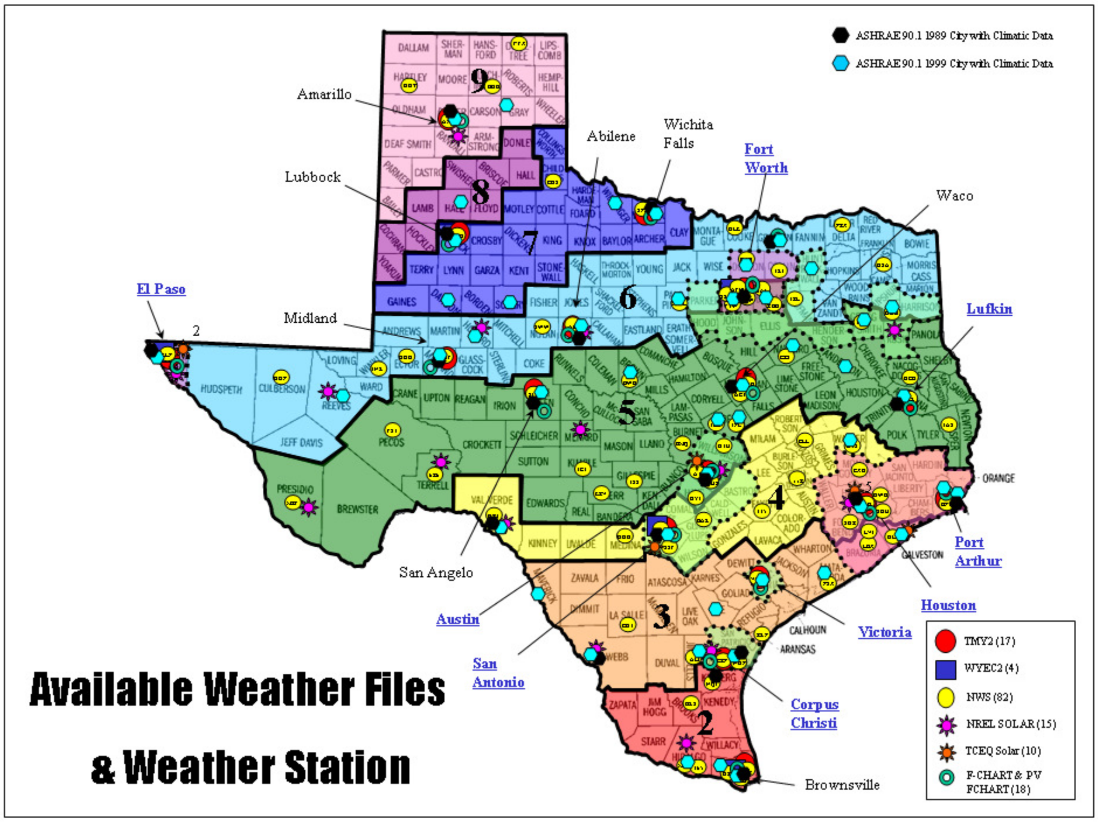
[12] The "2000 IECC" notation is used to signify the 2000 International Residential Code (IRC), which includes the International Energy Conservation Code (IECC) as modified by the 2001 Supplement (IECC 2001), published by the ICC in March of 2001, as required by Senate Bill 5.

[13] The ASHRAE 90.1-1989 and 90.1-1999 weather stations are used in the emissions calculator for determining the building characteristics.

[14] The NREL stations were the primary source of the 1999 global horizontal, direct normal and diffuse solar radiation used to determine the 1999 peak-day and annual emissions for the DOE-2 simulations for code-compliant housing and commercial buildings.

[15] The TCEQ stations were used as the secondary source for global horizontal solar radiation when the NREL sites were missing data or no NREL site was nearby.

[16] The F-Chart and PV F-Chart weather locations are used to determine the solar thermal or electricity produced by the systems specified by the use in the emissions calculation. The monthly energy or electricity production from F-Chart or PV F-Chart is then weather-normalized using ASHRAE's Inverse Model Toolkit to develop coefficients that are then used to determine the 1999 annual and peak day energy or electricity production for emissions calculations.



List of Available Weather Files and Weather Stations of Texas

Texas Weather Stations (NOAA)

1 Abilene Regional Airport (ABI)
2 Alice International Airport (ALI)
3 Amarillo International Airport (AMA)
4 Angleton / Lake Jackson Brazori (LBX)
5 Arlington Municipal Airport (GKY)
6 Austin - Bergstrom International (AUS)
7 Austin Camp Mabry (ATT)
8 Borger Hutchinson County Airport (BGD)
9 BRENHAM: BRENHAM MUNICIPAL AIRPORT (11R)
10 Brownsville S Padre Isl International (BRO)
11 BROWNWOOD: BROWNWOOD REGIONAL AIRPORT (BWD)
12 Burnet Municipal Airport (BMQ)
13 Childress Municipal Airport (CDS)
14 College Station (CLL)
15 Conroe Montgomery County Airport (CXO)
16 Corpus Christi International Airport (CRP)
17 CORPUS CHRISTI: CORPUS CHRISTI NAS/TRUAX FIELD ARPT (NGP)
18 Corsicana Campbell Field (CRS)
19 Cotulla La Salle Co Airport (COT)
20 Dalhart Municipal Airport (DHT)
21 Dallas - Fort Worth International Airport (DFW)
22 Dallas Love Field (DAL)
23 Dallas Redbird Airport (RBD)
24 Del Rio International Airport (DRT)
25 Denton Municipal Airport (DTO)
26 Dryden Terrell County Airport (6R6)
27 El Paso International Airport (ELP)
28 FALFURRIAS: BROOKS COUNTY AIRPORT (BKS)
29 Fort Stockton Pecos County Airport (FST)
30 Fort Worth Alliance Airport (AFW)
31 Fort Worth Meacham (FTW)
32 FREDERICKSBURG: GILLESPIE COUNTY AIRPORT (T82)
33 GAINESVILLE: GAINESVILLE MUNICIPAL AIRPORT (GLE)
34 Galveston Scholes Field (GLS)
35 GEORGETOWN: GEORGETOWN MUNICIPAL AIRPORT (GTU)
36 Harlingen Rio Grande Valley I (HRL)
37 Hondo Municipal Airport (HDO)
38 Houston Bush Intercontinental (IAH)
39 Houston Clover Field (LVJ)
40 Houston Hooks Memorial Airport (DWH)
41 Houston Sugarland Mem (SGR)
42 Houston William P Hobby Airport (HOU)
43 Huntsville Municipal Airport (UTS)
44 JASPER: JASPER COUNTY-BELL FIELD AIRPORT (JAS)
45 Junction Kimble County Airport (JCT)
46 KERRVILLE: KERRVILLE MUNI/LOUIS SCHREINER FLD AIRPORT (ERV)
47 KILLEEN: KILLEEN MUNICIPAL AIRPORT (ILE)
48 KINGSVILLE: KINGSVILLE NAS AIRPORT (NQI)
49 LA GRANGE: FAYETTE REGIONAL AIR CENTER AIRPORT (3T5)
50 Longview E Tx Rgnl Airport (GGG)
51 Lubbock International Airport (LBB)
52 Lufkin Angelina Cty Airport (LFK)
53 MARFA: MARFA MUNICIPAL AIRPORT (MRF)
54 McAllen Miller International Airport (MFE)
55 McKinney Municipal Airport (TKI)
56 Midland International Airport (MAF)
57 Mineral Wells Airport (MWL)
58 MOUNT PLEASANT: MOUNT PLEASANT REGIONAL AIRPORT (OSA)
59 NACOGDOCHES: A L MANGHAM JR REGIONAL AIRPORT (OCH)
60 New Braunfels Municipal Airport (BAZ)
61 Odessa Schlemeyer Field (ODO)
62 Palacios Municipal Airport (PSX)
63 PARIS: COX FIELD AIRPORT (PRX)
64 PERRYTON: PERRYTON OCHILTREE COUNTY AIRPORT (PYX)
65 Pine Springs Guadalupe Mounta (GDP)
66 Port Arthur Se Tx Rgnl Airport (BPT)
67 Port Isabel Cameron County Airport (PIL)
68 Rockport Aransas Co Airport (RKP)
69 San Angelo Mathis Field (SJT)
70 San Antonio International Airport (SAT)
71 San Antonio Stinson Municipal Airport (SSF)
72 SAN MARCOS: SAN MARCOS MUNICIPAL AIRPORT (HYI)
73 SWEETWATER: AVENGER FIELD AIRPORT (SWW)
74 TEMPLE: DRAUGHON-MILLER CNTRL TEXAS REGIONAL ARPT (TPL)
75 Terrell Municipal Airport (TRL)
76 Tyler Pounds Field (TYR)
77 Victoria Regional Airport (VCT)
78 WACO: MC GREGOR EXECUTIVE AIRPORT (PWG)
79 Waco Regional Airport (ACT)
80 WESLACO: MID VALLEY AIRPORT (T65)
81 Wichita Falls Municipal Airport (SPS)
82 Wink Winkler Co Airport (INK)

Texas TMY2 Weather Files

1 Abilene
2 Amarillo
3 Austin
4 Brownsville
5 Corpus Christi
6 El Paso
7 Fort Worth
8 Houston
9 Lubbock
10 Lufkin
11 Midland
12 Port Arthur
13 San Angelo
14 San Antonio
15 Victoria
16 Waco
17 Wichita Falls

Texas WYEC2 Weather Files

1 El Paso
2 Brownsville
3 Fort Worth
4 San Antonio

NREL Solar Stations

1 Abilene
2 Austin
3 Big Spring
4 Canyon
5 Clear Lake
6 Corpus Christi
7 Del Rio
8 Edinburg
9 El Paso
10 Laredo
11 Menard
12 Overton
13 Pecos
14 Presidio
15 Sanderson

TCEQ Solar Stations

1 Bexar
2 Travis
3 El Paso (2)
4 Galveston
5 Harris (5)

FCHART and PV FCHART (New Weather File)

1 ABILENE
2 AMARILLO
3 AUSTIN
4 BROWNSVILLE
5 CORPUS CHRISTI
6 EL PASO
7 FORT WORTH
8 HOUSTON
9 LUBBOCK
10 LUFKIN
11 MIDLAND-ODESSA
12 PORT ARTHUR
13 SAN ANGELO
14 SAN ANTONIO
15 SHERMAN
16 VICTORIA
17 WACO
18 WICHITA FALLS

Figure 4: Available NWS, TMY2 and WYEC2 weather files compared to IECC / IRC weather zones for Texas.

4.2 Energy Systems Laboratory's Responsibilities in the TERP.

In 2001, Texas Senate Bill 5 outlined the following responsibilities for the Energy Systems Laboratory (ESL) within the TERP:

- Sec. 386.205. Evaluation of State Energy Efficiency Programs.
- Sec. 388.003. Adoption of Building Energy Efficiency Performance Standards.
- Sec. 388.004. Enforcement of Energy Standards Outside of Municipality.
- Sec. 388.007. Distribution of Information and Technical Assistance.
- Sec. 388.008. Development of Home Energy Ratings.

These responsibilities were updated in 2003:
1) with House Bill 1365, including modifications to:

- Sec. 388.004. Enforcement of Energy Standards Outside of Municipality.
- Sec. 388.009. Energy-Efficient Building Program.

2) with House Bill 3235, including modifications to:

- Sec. 388.009. Certification of Municipal Building Inspectors.

These responsibilities were further updated in 2005:

- with Senate Bill 20, House Bill 2481, and 2129.

These responsibilities were further updated in 2007:

- with Senate Bill 12 and House Bill 3693.

These responsibilities were further updated in 2007:

- with Senate Bill 12 and House Bill 3693.

In the following sections each of these tasks is further described.

4.2.1 (SB 5) Section 386.205. Evaluation of State Energy Efficiency Programs (w/PUCT).

The Laboratory is instructed to assist the Public Utility Commission of Texas (PUCT) and provide an annual report that quantifies by county the reductions of energy demand, peak loads, and associated emissions of air contaminants achieved from the programs implemented under this subchapter and from those implemented under Section 39.905, Utilities Code (i.e., Senate Bill 7).(SB 5) Sec. 388.003. Adoption of Building Energy Efficiency Performance Standards.

TERP adopts the energy efficiency chapter of the 2001 International Residential Code (2001 IRC) as an energy code for single-family residential construction, and the 2001 International Energy Conservation Code (2001 IECC) for all other residential, commercial and industrial construction in the state. It requires that municipalities establish procedures for administration and enforcement, and ensure that code-certified inspectors perform inspections.

TERP provides that local amendments, in non-attainment areas and affected counties, may not result in less stringent energy efficiency requirements. The Laboratory is to review local amendments, if requested, and submit an annual report of savings impacts to the TCEQ. The Laboratory is also authorized to collect fees for certain of its tasks in Sections 388.004, 388.007 and 388.008.

4.2.3 (SB 5) Sec. 388.004. Enforcement of Energy Standards Outside of Municipality.

For construction outside of the local jurisdiction of a municipality, TERP provides for a building to comply if:

a) a building certified by a national, state, or local accredited energy efficiency program shall be considered in compliance;
b) a building with inspections from private code-certified inspectors using the energy efficiency chapter of the International Residential Code or International Energy Conservation Code shall be considered in compliance; and
c) a builder who does not have access to either of the above methods for a building shall certify compliance using a form provided by the Laboratory, enumerating the code-compliance features of the building.

4.2.4 (SB 5) Sec. 388.007. Distribution of Information and Technical Assistance.

The Laboratory is required to make available to builders, designers, engineers, and architects code implementation materials that explain the requirements of the International Energy Conservation Code and the energy efficiency chapter of the International Residential Code. TERP authorizes the Laboratory to develop simplified materials to be designed for projects in which a design professional is not involved. It also authorizes the Laboratory to provide local jurisdictions with technical assistance concerning implementation and enforcement of the International Energy Conservation Code and the energy efficiency chapter of the International Residential Code.(SB 5) Sec. 388.008. Development of Home Energy Ratings.

TERP requires the Laboratory to develop a standardized report format to be used by providers of home energy ratings (HERs). The form must be designed to give potential buyers information on a structure's energy performance, including certain equipment. TERP requires the Laboratory to establish a public information program to inform homeowners, sellers, buyers, and others regarding home energy ratings.

4.2.6 (HB 1365) Sec. 388.004. Enforcement of Energy Standards Outside of Municipality.

In 2003, House Bill 1365 modified Section 388.004 of The TERP to include the following new requirements:

- That builders shall retain for three years documentation which shows their building is in compliance with the Texas Building Energy Performance Standards, and that builders shall provide a copy of the compliance documentation to homeowners.
- That single-family residences built in unincorporated areas of counties, which were completed on or after September 1, 2001, but not later than August 31, 2003, are considered in compliance with the Texas Building Energy Performance Standards.

To help builders comply with these requirements, the Laboratory will enhance the current form, which is posted on the Laboratory's The TERP website.

4.2.7 (HB 1365) Sec. 388.009. Energy-Efficient Building Program.

In 2003, House Bill 1365 modified the TERP, adding a new Section 388.009. In this section the General Land Office, the TCEQ and the Laboratory, working with an advisory committee, may develop an energy-efficient building accreditation program for buildings that exceed the building energy performance standards under Section 388.003 by 15% or more. This program shall be updated annually to include best available energy-efficient building practices. This program shall use a checklist system to produce an energy-efficient building scorecard to help: (1) home buyers compare potential homes and, by providing a copy of the completed scorecard to a mortgage lender, qualify for energy-efficient mortgages under the National Housing Act; and (2) communities qualify for emissions reduction credits by adopting codes that meet or exceed the energy-efficient building or energy performance standards established under this chapter. This effort may include a public information program to inform homeowners, sellers, buyers, and others regarding energy-efficient building ratings. The Laboratory shall establish a system to measure the reduction in energy and emissions produced under the energy-efficient building program and report those savings to the commission.

4.2.8 (HB 3235) Sec. 388.009. Certification of Municipal Inspectors.

Also in 2003, House Bill 3235 modified the TERP to add the new Section 388.009. In this section the Laboratory is required to develop and administer a state-wide training program for municipal building inspectors who seek to become code-certified inspectors. To accomplish this, the Laboratory will work with national code organizations to assist participants in the certification program and is allowed to collect a reasonable fee from participants in the program to pay for the costs of administering the program. This program is required to be developed no later than January 1, 2004, with state-wide training sessions starting no later than March 1, 2004.

4.2.9 (SB 20, HB 2481, HB 2129). Additional Energy-Efficiency Initiatives.

The 79th Legislature, through SB 20, HB 2481 and HB 2129, amended SB 5 to enhance its effectiveness by adding the following additional energy-efficiency initiatives, including requiring 5,880 MW of generating capacity from renewable energy technologies by 2015, and 500 MW from non-wind renewables.

This legislation also requires PUCT to establish a target of 10,000 MW of installed renewable capacity by 2025, and requires TCEQ to develop a methodology for computing emissions reductions from renewable energy initiatives and the associated credits. The Laboratory is to assist TCEQ in quantifying emissions reductions credits from energy-efficiency and renewable-energy programs, through a contract with the Texas Environmental Research Consortium (TERC) to develop and annually calculate creditable emissions reductions from wind and other renewable energy resources for the state's SIP.

Finally, this legislation requires the Laboratory to develop at least 3 alternative methods for achieving a 15 % greater potential energy savings in residential, commercial and industrial construction. To accomplish this, the Laboratory will be using the code-compliance calculator to ascertain which measures are best suited for reducing energy use without requiring substantial investments.

4.2.10 (SB 12, HB 3693). Additional Energy-Efficiency Initiatives.

The 80th Legislature (2007), through SB 12, and HB 3693 amended SB 5 to enhance its effectiveness by adding several new energy efficiency initiatives. First, it requires the Laboratory to provide written recommendations to the State Energy Conservation Office (SECO) about whether or not the energy efficiency provisions of latest published edition of the International Residential Code (IRC), or the International Energy Conservation Code (IECC), are equivalent to or better than the energy efficiency and air quality achievable under the editions adopted under the 2001 IRC/IECC. The laboratory shall make its recommendations not later than six months after publication of new editions at the end of each three-year code development cycle of the International Residential Code and the International Energy Conservation Code. As part of this work with SECO, the Laboratory is required to consider comments made by persons who have an interest in the adoption of the energy codes in the recommendations made to SECO.

In addition, it requires the Laboratory to develop a standardized report format to be used by providers of home energy ratings, including different report formats for rating newly constructed residences from those for existing residences. The form must be designed to give potential buyers information on a structure's energy performance, including: insulation; types of windows; heating and cooling equipment; water heating equipment; additional energy conserving features, if any; results of performance measurements of building tightness and forced air distribution; and an overall rating of probable energy efficiency relative to the minimum requirements of the International Energy Conservation Code or the energy efficiency chapter of the International Residential Code, as appropriate.

It also encourages the Laboratory to cooperate with an industry organization or trade association to: develop guidelines for home energy ratings; provide training for individuals performing home energy ratings and providers of home energy ratings; and provide a registry of completed ratings for newly constructed residences and residential improvement projects for the purpose of computing the energy savings and emissions reductions benefits of the home energy ratings program. Finally, it requires the Laboratory shall to include information on the benefits attained from this program in an annual report to the commission.

5 PROGRESS: JANUARY 2006 TO JUNE 2007

5.1 (SB 5) Section 386.205. Evaluation of State Energy-Efficiency Programs (w/PUCT).

5.1.1 Implemented Procedures for Evaluating State Energy-Efficiency Programs

In 2004 the Laboratory held several meetings with the Public Utility Commission of Texas to discuss the development of a framework for reporting emissions reduction from the State Energy Efficiency Programs administered by the PUCT. The State Energy-Efficiency Programs administered by the PUCT include programs under Senate Bill 7 (i.e., Section 39.905 Utilities Code) and Senate Bill 5.

In 2003 and 2004, the Laboratory worked with the TCEQ to identify a method to help the PUCT more accurately report their deemed savings as peak-day savings in 1999, using the Laboratory's new emissions reductions calculator. In 2005, this method was implemented in the TCEQ's Integrated Emissions Calculations, which was reported in the 2005 and 2006 annual report, and in this 2007 annual report.

5.2 (SB 5) Sec. 388.003. Adoption of Building Energy-Efficiency Performance Standards.

5.2.1 Provide Code Training Sessions

During the 77th Legislature, Senate Bill 5 (SB 5) adopted the 2000 International Residential Code (IRC) as the energy code for single-family residential construction and the 2000 edition of the International Energy Conservation Code (IECC), with the 2001 Supplement for all other residential, commercial and industrial construction in the state. It requires that municipalities establish procedures for administration and enforcement, and ensure that code-certified inspectors perform inspections.

These codes are published by the International Code Council (ICC), which publishes a new edition every three years and a supplement in the intervening years. The 2003 Codes have been reviewed and determined to be no less stringent than the editions currently adopted by SB 5. Transition to the 2003 IRC and IECC can be easily accomplished.

Section 388.009 requires the Laboratory to develop and administer a state-wide training program for municipal building inspectors who seek to become code-certified inspectors. To accomplish this, the Laboratory developed the Energy Code Workshops which are based on the 2003 International Energy Conservation Code (IECC) as published by the International Code Council (ICC) for residential and commercial buildings. In addition, three more workshops were developed that offered software training, ASHRAE Standard 62.1 and ASHRAE Standard 90.1.

The Residential Energy Code Training Workshop and Commercial Requirements of the International Energy Conservation Workshop both include an overview of the TERP program and extensive instruction on all chapters of the IECC, which include the General requirements, definitions, and design conditions. The Residential Workshop also includes detailed instruction on Chapters 4, 5 and 6, which are the specific regulations relating to residential construction, in addition to a comparison of the IECC and the energy provisions of the International Residential Code (IRC). The Commercial Workshop includes detailed instruction on Chapters 7 and 8, which relate to commercial regulations and a summary of the relationship between ASHRAE 90.1 and the commercial provisions of the IECC.

The ASHRAE 90.1 Workshop includes a brief overview of SB 5 and a summary of the relationship between ASHRAE 90.1 and the Commercial provisions of the IECC. ASHRAE Standard 62.1 workshops provide training concerning ASHRAE commercial building ventilation rates. Software workshops were also developed to begin the training of the use of software for calculating code compliance.

Table 2: IECC / IRC Residential and ASHRAE 90.1 Commercial Building Code Workshops for TERP during the Period January to December 2007.

LOCATION	RESIDENTIAL	COMMERCIAL	SOFTWARE	ASHRAE 62.1	ASHRAE 90.1
Dallas				01/25/07	
Dallas					02/13/07
Dallas	02/13/07				
Austin	02/15/07				
Houston	03/13/07				
Houston					03/13/07
Dallas					03/14/07
Austin	03/15/07				
Austin					03/15/07
Dallas				04/10/07	
Dallas					04/11/07
Lubbock	04/17/07				
San Antonio	04/19/07				
Arlington (BPI)			05/16/07		
Longview			05/31/07		
Longview			05/31/07		
Fort Worth			09/14/07		
Forney	09/08/07				
Wichita Falls			09/06/07		
Wichita Falls	09/05/07				
Austin					07/11/07
College Station			06/22/07		
College Station			06/22/07		
Waco			06/21/07		
Waco			06/21/07		
Nacogdoches			06/01/07		
Nacogdoches			06/01/07		

5.2.2 Provide Recommendations on Code Upgrades.

During the 77th Legislature Senate Bill 5 (SB 5) adopted the 2000 International Residential Code (IRC) as the energy code for single-family residential construction, and the 2000 edition of the International Energy Conservation Code (IECC), with the 2001 Supplement for all other residential, commercial and industrial construction in the state. It requires that municipalities establish procedures for administration and enforcement, and ensure that code-certified inspectors perform inspections.

These codes are published by the International Code Council (ICC), which publishes a new edition every three years and a supplement in the intervening years. The 2003 Codes have been reviewed and determined to be no less stringent that the editions currently adopted by SB 5. Transition to the 2003 IRC and IECC can be easily accomplished.

The 2006 Codes have been reviewed and information regarding their stringency is presented in a later section.

5.2.3 Summary of ASHRAE Standard 90.1 Standards Committee Activities during 2007, and Ongoing Subcommittee Actions.

This segment reports on the activities of the ASHRAE 90.1 Standards Committee with regard to subcommittee actions and recommendations on addenda items for the next cycle of the Standard. Information presented is from the 2007 ASHRAE meetings in Dallas, TX (January) and in Long Beach, CA (June) as well as work done in between these main meetings by the subcommittees. Most of the Standard 90.1 subcommittees' work has involved updates to the 2004 version of ASHRAE 90.1 that will result in the 2007 version. The 90.1 Standards Subcommittee work is presented in order of: Lighting, Envelope, ECB (Energy Cost Budget) and Mechanical. What will be revealed in all of the reporting of committee work will be recommended or approved updates for the 2007 (and sometimes 2010) version of the 90.1 Standard.

5.2.3.1 Documentation process of development of ASHRAE Standard 90.1

A documentation process is being developed to keep track of the changes and developments taking place in the evolution of ASHRAE Standard 90.1 over a period of time. The process involves preparing an excel catalog that will keep track of discussions and updates on the ASHRAE 90.1 Standard through several sources. The tracking process covers agendas, minutes and notes at ASHRAE Meetings; Interpretations of the existing standard, changes in proposals and responses to change proposals; Addendum to the standard and related interaction between different members; publication and presentations on the relevant topics. All this information is obtained from sources such as Email subscription to Building Energy Related mailing lists, Meeting Notes and the ASHRAE Website. A snapshot of the excel tracking sheet is presented in Figure 5.


ASHRAE Catlog.xls [Compatibility Mode] - Microsoft Excel

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SR.No.	File ID	Type	Subject	Author	Date
1	MBR 5-12-05	Fuel Prices	Presentation on ASHRAE Std. 90.1 -2007	Merle McBride	Thursday, May 12,
2	FPR 6-22-05	Fuel Prices	sspc9011 Standard 90.1 Fuel and Electric Prices	Larry Spielvogel	Wednesday, June 22
3	FPR 6-23-05	Fuel Prices	Relationship of CBECS Coverage to EIA Supply Surveys(DOE Explanation)		Thursday, June 23,
4	CDT 6-23-05	Fuel Prices	Standard 90.1 Energy Cost Determination		Thursday, June 23,
5	EPR 6-23-05	Fuel Prices	Standard 90.1 Energy Prices		Thursday, June 23,
6	ACT 8-8-05	ACT	(Public Law 109-58) Energy Policy Act of 2005		Monday, August 08,
7	INT 1-23-06	Interpretation	Interpretation IC 90.1-2004-3 of ANSI/ASHRAE/IESNA Standard		Monday, January 23,
8	BLT 6-26-06	Bulletin	Internal Revenue Bulletin		Monday, June 26,
9	GLA 1-02-06	Agenda	90.1 Energy cost Budget Subcommittee Meeting Agenda (Dallas-Jan.)	Jason Glazor	Tuesday, January 02
10	EXL 1-22-07	Fans calc.	PTAC Fans		Monday, January 22,
11	DER 02-07-07	Tech Report	Energy Saving modeling and inspection guideline(NREL TAX DED)	M. Deru	Wednesday, February
12	INT 4-2-07	Interpretation	Interpretation IC 90.1-2004-7 of ANSI/ASHRAE/IESNA Standard		Monday, April 02,
13	GLA 4-02-07	Agenda	90.1 Energy cost Budget Subcommittee Meeting Agenda (Chicago-Apr.)	Jason Glazor	Monday, April 02,
14	ROS 04-05-07	Addenda	Addenda Review	Michael Rosenberg	Thursday, April 05,
15	EXL 4-18-07	Energy Calc.	EER typical fan energy calculation		Wednesday, April 18
16	APDX 4-4-07	Appendix	Building Performance Method (ApndxG2004(th-mr))		Tuesday, April 24,
17	DER 05-07-07	Tech Report	Energy Saving modeling and inspection guideline(NREL TAX DED)	M. Deru	Monday, May 07,
18	APDX 6-6-07	Appendix	Building Performance Method (Appendix G of User's Manual for ASHRAE 2004)		Wednesday, June 06
19	NOT 6-6-07	Notice	Notice 2006-52 (Part III- Administrative, Procedural and Miscellaneous) Deductions for Energy Efficient commercial buildings		Wednesday, June 06
20	GLA 06-12-07	Agenda	Long Beach Meeting Agenda	Jason Glazor	Tuesday, June 12,
21	PRC 6-25-07	Proposed Change	90-1 scope modifications proposal (Section 2.3c)	David Weitz	Monday, June 25,
22	FPF 9-26-07	Section G	Fan Power Fix documentation(conversion to SI)		Tuesday, June 26,
23	GLA 10-04-07	Agenda	October Meeting Agenda	Jason Glazor	Thursday, October 04
24	INT 10-12-07	Interpretation	Interpretation IC 90.1-2004-8 of ANSI/ASHRAE/IESNA Standard		Friday, October 12,
25	INT10 10-12-07	Interpretation	Interpretation IC 90.1-2004-10 of ANSI/ASHRAE/IESNA Standard		Friday, October 12,
26	INT 10-13-07	Interpretation	Interpretation IC 90.1-2004-9 of ANSI/ASHRAE/IESNA Standard		Saturday, October 13
27	TAL 10-24-07	Addendum	Re: [BLDG-SIM] New Calculation method for Baseline Fan Energy in Addendum R	Bill Talbert	Wednesday, October
28	GLA 11-27-07	Addenda	Addenda R Comments	Jason Glazor	Tuesday, November 2
29	HOG 11-27-07	Addenda	Addenda R Comments	John Hogan	Tuesday, November 2
30	GLA 11 -29 -07	Addenda	Comments on Addenda R	Jason Glazor	Thursday, November
31	GLA 01-07-08	Agenda	Agenda for New York and Conference call on Jan 15	Jason Glazor	Monday, January 07,
32	HAB 01-15-08	Agenda	Agenda for New York and Conference call on Jan 15	Jeff Haberl	Tuesday, January 15

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Figure 5: Snapshot of the excel tracking sheet

The Excel sheet used to catalogue these developments and changes is divided into 5 tabs. Each tab exclusively keeps track of developments in each of the ASHRAE Subcommittees i.e. ECB, envelope, lighting, mechanical and main committee meetings. Documents coming from various sources are transferred to the respective folders. Details of each input such as subject, author, source, date of actual document and date are also tracked. Depending on content, each document is categorized with keywords such as 'interpretation', 'addendum', etc. A unique tracking number is given to document by combining author initials and date or keyword initials and date. A hyperlink is provided to access the actual document.

Summary of ASHRAE Standards Committee Activities during 2006 - 07, and ongoing subcommittee actions

The following paragraphs summarize discussions at the ASRAE Standards Committee meetings at Dallas, January 2007and Long Beach June 2007.

5.2.3.2 Summary comment on the status on the 90.1 standard

Overall agenda

1. Continuance of the 30-50-70 % reduction in energy initiative began a few years ago.
2. Announcement of other directives/mandates for new reduction targets for years leading up to 2031, to reach Net Zero buildings by that date. Full committee is to examine the statements to reach clarity on interpretation of the mandated targets.
3. Motion passed that ASHRAE make available free copies of Standard 90.1-2007 to building code officials in jurisdictions that have adopted the Standard. Response the overwhelming concern expressed by standards users that ASHRAE should focus more on promoting its standards to code officials in order to achieve uniform and correct interpretation. The 2005 Market Needs Research Report found that 92% of respondents either agreed or strongly agreed that this is a direction the ASHRAE should take. The suggestion to provide Standard 90.1 to code officials seems like the very minimum toward equipping them with the tools they would need for properly enforcement.
4. Motion that responds to the request by standards users (per the 2005 Market Needs Research Report) to include more application examples along with the standards the ASHRAE produces. Standard 90.1 has the benefit of its User's Manual; combining the standard with the Manual would make its value inseparable.
5. Other discussions included Proposed changes to the IECC , using energy cost vs. energy usage in the 90.1 standard, and a proposal on inclusion of linked criteria selection for ASHRAE standard 90.1 2010.

5.2.3.3 From Lighting Subcommittee

1. Second draft to the lighting benchmark criteria for the AEDG discussed. Several cosmetic changes were recommended to the draft. Significant changes include the addition of retail and institutional spaces to the table describing lighting quality issues. The advanced building benchmark provides a general overview of the lighting and daylighting issues designers face when designing an energy-efficient building–after the overview, subsequent sections provide more detailed guidance for meeting the specific Advanced Buildings Benchmark criteria.
2. Lighting requirements for 90.1 2001 with 2004 addenda and IECC 2003 compared. These include pointing differences regarding automatic lighting shutoff, additional controls, tandem wiring, exterior building lighting power and electrical energy consumption.
3. Four proposals for lighting requirements for IECC 2006 were reviewed. They are: Lighting for retail stores, Line-voltage lighting track and plug-in busway, and Interior lighting power.
4. Changes to the exterior lighting specifications proposed in 90.1 2007 discussed. This proposal will apply a 4-zone lighting power density approach to exterior lighting requirements. This approach recognizes the varying lighting needs and design differences associated with different building locations. It is acceptable and prudent to reduce the light levels as the designer leaves the downtown city center entering into mixed commercial/high-rise residential districts, then enters into residential areas, and then into rural areas. The proposed changes are summarized in Table 3, Table 4a, b and Table 6c.

Table 3: Proposed Table 9.4.5 for Exterior Lighting Zones

Lighting Zone	Description
1	Developed areas of National Parks, State Parks, Forest Land, and Rural areas
2	Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed use areas
3	All other areas
4	High activity commercial districts in major metropolitan areas as designated by the local jurisdiction

Table 4: Proposed Table 9.4.6 for Individual Lighting Power Allowances for Building Exteriors

	Zone 4	Zone 3	Zone 2	Zone 1
Base Site Allowance (base allowance may be used in tradable or non-tradable surfaces)	1300 W	750 W	600 W	500 W

Table 5: Proposed Table 9.4.6 for Individual Lighting Power Allowances for Building Exteriors

Tradable Surfaces (Lighting power densities for uncovered parking areas, building grounds, building entrances and exits, canopies and overhangs and outdoor sales areas may be traded.)	Uncovered Parking Areas				
	Parking areas and drives	0.13 W/ft^2	0.10 W/ft^2	0.06 W/ft^2	0.04 W/ft^2
	Building Grounds				
	Walkways less than 10 feet wide	1.0 W/linear foot	0.8 W/linear foot	0.7 W/linear foot	0.7 W/linear foot
	Walkways 10 feet wide or greater Plaza areas Special Feature Areas	0.2 W/ft^2	0.16 W/ft^2	0.14 W/ft^2	0.14 W/ft^2
	Stairways	1.0 W/ft^2	1.0 W/ft^2	1.0 W/ft^2	0.75 W/ft^2
	Pedestrian Tunnels	0.3 W/ft^2	0.2 W/ft^2	0.15 W/ft^2	0.15 W/ft^2
	Landscaping	0.05 W/ft^2	0.05 W/ft^2	0.05 W/ft^2	0.04 W/ft^2
	Building Entrances and Exits				
	Main entries	30 W/linear foot of door width	30 W/linear foot of door width	20 W/linear foot of door width	20 W/linear foot of door width
	Other doors	20 W/linear foot of door width	20 W/linear foot of door width	20 W/linear foot of door width	20 W/linear foot of door width
	Entry Canopies	0.4 W/ft^2	0.4 W/ft^2	0.25 W/ft^2	0.25 W/ft^2
	Sales Canopies				
	free standing and attached	1.0 W/ft^2	0.8 W/ft^2	0.6 W/ft^2	0.6 W/ft^2
	Outdoor Sales				
	Open areas (including	0.7 W/ft^2	0.5 W/ft^2	0.25 W/ft^2	0.25 W/ft^2

	vehicle sales lots)				
	Street frontage for vehicle sales lots in addition to "open area" allowance	30 W/linear foot	10 W/linear foot	10 W/linear foot	No allowance

Table 6: Proposed Table 9.4.6 for Individual Lighting Power Allowances for Building Exteriors

Non-Tradable Surfaces (Lighting power density calculations for the following applications can be used only for the specific application and can-not be traded between surfaces or with other exterior lighting. The following allowances are in addition to any allowance otherwise permitted in the "tradable Surfaces" section of this table.)	Building Facades	0.2 W/ft^2 for each illuminated wall or surface or 5.0 W/linear foot for each illuminated wall or surface length	0.15 W/ft^2 for each illuminated wall or surface or 3.75 W/linear foot for each illuminated wall or surface length	0.1 W/ft^2 for each illuminated wall or surface or 2.5 W/linear foot for each illuminated wall or surface length	No allowance
	Automated teller machines and night depositories	270 W per location plus 90 W per additional ATM per location	270 W per location plus 90 W per additional ATM per location	270 W per location plus 90 W per additional ATM per location	270 W per location plus 90 W per additional ATM per location
	Entrances and gatehouse inspection stations at guarded facilities	0.75 W/ft^2 of covered and uncovered area	0.75 W/ft^2 of covered and uncovered area	0.75 W/ft^2 of covered and uncovered area	0.75 W/ft^2 of covered and uncovered area
	Loading areas for law enforcement, fire, ambulance and other emergency service vehicles	0.5 W/ft^2 of covered and uncovered area	0.5 W/ft^2 of covered and uncovered area	0.5 W/ft^2 of covered and uncovered area	0.5 W/ft^2 of covered and uncovered area
	Drive-up windows/doors	400 W per drive-through	400 W per drive-through	400 W per drive-through	400 W per drive-through
	Parking near 24-hour retail entrances	800 W per main entry	800 W per main entry	800 W per main entry	800 W per main entry

5. Revisions to addendum "d" High performance skylighting discussed and passed. The proposed addendum would provide an exemption to the SHGC requirements when high-diffusion skylights are used in conjunction with a multi-level photocontrol system.
6. Daylighting controls and interpretations related to daylight controls –

- Proposed Table 7 which presents the control factors used in calculating additional interior lighting power allowances. The additional interior lighting power Allowance are calculated by using the equation

Additional Interior Lighting Power Allowance = Lighting Power Under Control x Control Factor

- Second motion is approve response to reject proposed changes to use skylight requirements also on rooftop monitors, clerestories, etc.
- Regarding photo multi-level control interpretation: Proposal to approve response to assert that multi-level control included continuous dimming devices.

– Motion to approve response to reject proposal to exempt photo controls when they are not cost-effective. Occupancy sensors exempt the requirements for daylighting controls.

7. Voted to reject first proposal on Lighting Power Density table revisions.

Table 7: Proposed Table 9.6.2 Control Factors Used in Calculating Additional Interior Lighting Power Allowance

	Control Factors										
	Additional Control Method (in addition to mandatory requirements)										
Space Type	Personal space dimming control or other manual dimming control	Tuning	Multi-scene dimming control	Bi-level switching	Occupancy Sensing	Vacancy sensing	Daylight switching from sidelit applications	Daylight dimming from sidelit applications	Daylight switching from skylit applications (< 5,000 sq.ft.)	Daylight dimming from skylit applications (< 5,000 sq.ft.)	Monitoring
Open office	0.05						0.15	0.25	0.15	0.25	
Private office	0.05										
Conf./meeting room	0		M		M	M					
Classroom (lecture/training)	0		M		M	M					
Lobby	0										
Atrium	0										
Dining area	0										
Restrooms					0.40	0.40					
Corridors/stairways						0					
Gym	0	0			0	0					
Patient room					0	0					
Medical examination room					0	0					
Retail sales area	0				0	0					
Back of house (retail)											
Mall concourse	0				0	0					
Notes:											

1) M = mandatory requirement or one of two or more alternative mandatory requirements
2) Control factors for multiple control methods in the same space may be added together to get total control factor for the space.

5.2.3.4 From Envelope Subcommittee

1. Envelope subcommittee discussions centered on orientation aspects for additions modifications in ASHRAE standard 90.1 2007. To reduce solar gains from the east and west in climate zones 1 through 4 and from the west in climate zones 5 and 6, the fenestration area and SHGC shall meet certain requirements as proposed.
2. Proposed changes to vestibule requirements are up for public review. The exterior envelope of conditioned vestibules shall comply with the requirements for a conditioned space. The interior and exterior envelope of unconditioned vestibules shall comply with the requirements for a semi-heated space. Zonal criteria have been added for zones 3 and 4 depending on the size of the building.
3. Update envelope R-value criteria table for semi-heated metal buildings. This proposed addendum updates the building envelope criteria for metal buildings for the first time since 90.1-1999. Other envelope criteria were updated through addenda as and at. Table 8 to Table 16 record the changes for metal roofs and walls as proposed in addendum al. Table 17and Table 18 present the modified values of typical construction assemblies listed in Normative Appendix A which are used to determine compliance.

Table 8: Proposed building envelope requirements for climate zone 1(A,B)

TABLE 5.5-1
Building Envelope Requirements For Climate Zone 1 (A,B)

		Nonresidential		Residential		Semiheated	
	Opaque Elements	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
Roofs							
	Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-1.282	NR
	Metal Building[a]	U-0.065	R-19.0	U-0.065	R-19.0	~~U-1.280~~ U-0.167	~~NR~~ R-6.0
	Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.614	NR
Walls, Above Grade							
	Mass	U-0.580	NR	U-0.151[~~a~~b]	R-5.7 ci[~~a~~b]	U-0.580	NR
	Metal Building	~~U-0.113~~ U-0.093	~~R-13.0~~ R-16.0	~~U-0.113~~ U-0.093	~~R-13.0~~ R-16.0	U-1.180	NR
	Steel Framed	U-0.124	R-13.0	U-0.124	R-13.0	U-0.352	NR
	Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.292	NR
Wall, Below Grade							
	Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors							
	Mass	U-0.322	NR	U-0.322	NR	U-0.322	NR
	Steel Joist	U-0.350	NR	U-0.350	NR	U-0.350	NR
	Wood Framed and Other	U-0.282	NR	U-0.282	NR	U-0.282	NR
Slab-On-Grade Floors							
	Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
	Heated	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors							
	Swinging	U-0.700		U-0.700		U-0.700	
	Non-Swinging	U-1.450		U-1.450		U-1.450	
	Fenestration	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)
Vertical Glazing,% of Wall							
	0-10.0%	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.61}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.61}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
	10.1-20.0%	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.61}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.61}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
	20.1-30.0%	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.61}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.61}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
	30.1-40.0%	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.44}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.44}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
	40.1-50.0%	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{fixed}^{-0.98}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.33}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{-0.33}$	$^{U}\text{oper}^{-1.02}$	$^{SHGC}\text{north}^{NR}$
Skylight with Curb, Glass,% of Roof							
	0-2.0%	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-0.36}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-NR}$
	2.1-5.0%	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-0.16}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-NR}$
Skylight with Curb, Plastic,% of Roof							
	0-2.0%	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-0.34}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-0.27}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-NR}$
	2.1-5.0%	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-0.27}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-0.27}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-NR}$
Skylight without Curb, All,% of Roof							
	0-2.0%	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-0.36}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-NR}$
	2.1-5.0%	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-NR}$

[a] When using R-value compliance method, a thermal spacer block is required, otherwise use the U-Factor compliance method. See Table A2.3.

[~~a~~b] Exception to A3.1.3.1 applies.

Table 9: Proposed building envelope requirements for climate zone 2(A,B)

TABLE 5.5-2
Building Envelope Requirements For Climate Zone 2 (A,B)

		Nonresidential		Residential		Semiheated	
		Assembly	Insulation Min.	Assembly	Insulation Min.	Assembly	Insulation Min.
	Opaque Elements	Maximum	R-Value	Maximum	R-Value	Maximum	R-Value
Roofs							
	Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.218	R-3.8 ci
	Metal Building[a]	~~U-0.065~~ U-0.055	~~R-19.0~~ R-13.0 + R-13.0	~~U-0.065~~ U-0.055	~~R-19.0~~ R-13.0 + R-13.0	U-0.167	R-6.0
	Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.081	R-13.0
Walls, Above Grade							
	Mass	U-0.580	NR	U-0.151[~~a~~b]	R-5.7 ci[~~a~~b]	U-0.580	NR
	Metal Building	~~U-0.113~~ U-0.093	~~R-13.0~~ R-16.0	~~U-0.113~~ U-0.093	~~R-13.0~~ R-16.0	U-0.184	R-6.0
	Steel Framed	U-0.124	R-13.0	U-0.124	R-13.0	U-0.352	NR
	Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.292	NR
Wall, Below Grade							
	Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors							
	Mass	U-0.137	R-4.2 ci	U-0.107	R-6.3 ci	U-0.322	NR
	Steel Joist	U-0.052	R-19.0	U-0.052	R-19.0	U-0.350	NR
	Wood Framed and Other	U-0.051	R-19.0	U-0.051	R-19.0	U-0.282	NR
Slab-On-Grade Floors							
	Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
	Heated	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors							
	Swinging	U-0.700		U-0.700		U-0.700	
	Non-Swinging	U-1.450		U-1.450		U-1.450	
	Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall							
	0-10.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
		U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
	10.1-20.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
		U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
	20.1-30.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
		U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
	30.1-40.0%	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-0.25	U_{fixed}-1.22	$SHGC_{all}$-NR
		U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$-0.61	U_{oper}-1.27	$SHGC_{north}$NR
	40.1-50.0%	U_{fixed}-1.22	$SHGC_{all}$-0.17	U_{fixed}-1.22	$SHGC_{all}$-0.17	U_{fixed}-0.98	$SHGC_{all}$-NR
		U_{oper}-1.27	$SHGC_{north}$-0.44	U_{oper}-1.27	$SHGC_{north}$-0.43	U_{oper}-1.02	$SHGC_{north}$NR
Skylight with Curb, Glass,% of Roof							
	0-2.0%	U_{all}-1.98	$SHGC_{all}$-0.36	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
	2.1-5.0%	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-0.19	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof							
	0-2.0%	U_{all}-1.90	$SHGC_{all}$-0.39	U_{all}-1.90	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
	2.1-5.0%	U_{all}-1.90	$SHGC_{all}$-0.34	U_{all}-1.90	$SHGC_{all}$-0.27	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof							
	0-2.0%	U_{all}-1.36	$SHGC_{all}$-0.36	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR
	2.1-5.0%	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-0.19	U_{all}-1.36	$SHGC_{all}$-NR

[a] When using R-value compliance method, a thermal spacer block is required, otherwise use the U-Factor compliance method. See Table A2.3.

[~~a~~b] Exception to A3.1.3.1 applies.

Table 10: Proposed building envelope requirements for climate zone 3(A,B,C)

TABLE 5.5-3
Building Envelope Requirements For Climate Zone 3 (A,B,C)

		Nonresidential		Residential		Semiheated	
	Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs							
	Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.218	R-3.8 ci
	Metal Building[a]	~~U-0.065~~ <u>U-0.055</u>	~~R-19.0~~ <u>R-13.0 + R-13.0</u>	~~U-0.065~~ <u>U-0.055</u>	~~R-19.0~~ <u>R-13.0 + R-13.0</u>	U-0.097	R-10.0
	Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.081	R-13.0
Walls, Above Grade							
	Mass	U-0.151[ab]	R-5.7 ci[ab]	U-0.123	R-7.6 ci	U-0.580	NR
	Metal Building	~~U-0.113~~ <u>U-0.084</u>	~~R-13.0~~ <u>R-19.0</u>	~~U-0.113~~ <u>U-0.084</u>	~~R-13.0~~ <u>R-19.0</u>	~~U-0.184~~ <u>U-0.134</u>	~~R-6.0~~ <u>R-10.0</u>
	Steel Framed	U-0.124	R-13.0	U-0.084	R-13.0 + R-3.8 ci	U-0.352	NR
	Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.089	R-13.0
Wall, Below Grade							
	Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors							
	Mass	U-0.107	R-6.3 ci	U-0.087	R-8.3 ci	U-0.322	NR
	Steel Joist	U-0.052	R-19.0	U-0.052	R-19.0	U-0.069	R-13.0
	Wood Framed and Other	U-0.051	R-19.0	U-0.033	R-30.0	U-0.282	NR
Slab-On-Grade Floors							
	Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
	Heated	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors							
	Swinging	U-0.700		U-0.700		U-0.700	
	Non-Swinging	U-1.450		U-0.500		U-1.450	
	Fenestration (for Zones 3A and 3B; see next page for Zone 3C)	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall							
	0-10.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
	10.1-20.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
	20.1-30.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.39}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.39}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
	30.1-40.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.25}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.39}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.39}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
	40.1-50.0%	$^{U}\text{fixed}^{-0.46}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{fixed}^{-0.46}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{fixed}^{-0.98}$	$^{SHGC}\text{all}^{-NR}$
		$^{U}\text{oper}^{-0.47}$	$^{SHGC}\text{north}^{-0.26}$	$^{U}\text{oper}^{-0.47}$	$^{SHGC}\text{north}^{-0.26}$	$^{U}\text{oper}^{-1.02}$	$^{SHGC}\text{north}^{NR}$
Skylight with Curb, Glass,% of Roof							
	0-2.0%	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.36}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-NR}$
	2.1-5.0%	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-NR}$
Skylight with Curb, Plastic,% of Roof							
	0-2.0%	$^{U}\text{all}^{-1.30}$	$^{SHGC}\text{all}^{-0.65}$	$^{U}\text{all}^{-1.30}$	$^{SHGC}\text{all}^{-0.27}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-NR}$
	2.1-5.0%	$^{U}\text{all}^{-1.30}$	$^{SHGC}\text{all}^{-0.34}$	$^{U}\text{all}^{-1.30}$	$^{SHGC}\text{all}^{-0.27}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-NR}$
Skylight without Curb, All,% of Roof							
	0-2.0%	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.36}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-NR}$
	2.1-5.0%	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.19}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-NR}$

[a] <u>When using R-value compliance method, a thermal spacer block is required, otherwise use the U-Factor compliance method. See Table A2.3.</u>

[ab] Exception to A3.1.3.1 applies.

Table 11: Proposed building envelope requirements for climate zone 3C

TABLE 5.5-3 (continued)
Building Fenestration Requirements For Climate Zone 3C

		Nonresidential		Residential		Semiheated	
	Fenestration (for Zone 3C)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)
Vertical Glazing,% of Wall							
	0-10.0%	Ufixed-1.22	SHGCall-0.61	Ufixed-1.22	SHGCall-0.61	Ufixed-1.22	SHGCall-NR
		Uoper-1.27	SHGCnorth-0.82	Uoper-1.27	SHGCnorth-0.82	Uoper-1.27	SHGCnorth-NR
	10.1-20.0%	Ufixed-1.22	SHGCall-0.39	Ufixed-1.22	SHGCall-0.61	Ufixed-1.22	SHGCall-NR
		Uoper-1.27	SHGCnorth-0.61	Uoper-1.27	SHGCnorth-0.61	Uoper-1.27	SHGCnorth-NR
	20.1-30.0%	Ufixed-1.22	SHGCall-0.39	Ufixed-1.22	SHGCall-0.39	Ufixed-1.22	SHGCall-NR
		Uoper-1.27	SHGCnorth-0.61	Uoper-1.27	SHGCnorth-0.61	Uoper-1.27	SHGCnorth-NR
	30.1-40.0%	Ufixed-1.22	SHGCall-0.34	Ufixed-1.22	SHGCall-0.34	Ufixed-1.22	SHGCall-NR
		Uoper-1.27	SHGCnorth-0.61	Uoper-1.27	SHGCnorth-0.61	Uoper-1.27	SHGCnorth-NR
	40.1-50.0%	Ufixed-1.22	SHGCall-0.20	Ufixed-0.73	SHGCall-0.25	Ufixed-0.98	SHGCall-NR
		Uoper-1.27	SHGCnorth-0.39	Uoper-0.81	SHGCnorth-0.61	Uoper-1.02	SHGCnorth-NR
Skylight with Curb, Glass,% of Roof							
	0-2.0%	Uall-1.98	SHGCall-0.61	Uall-1.98	SHGCall-0.39	Uall-1.98	SHGCall-NR
	2.1-5.0%	Uall-1.98	SHGCall-0.39	Uall-1.98	SHGCall-0.19	Uall-1.98	SHGCall-NR
Skylight with Curb, Plastic,% of Roof							
	0-2.0%	Uall-1.90	SHGCall-0.65	Uall-1.90	SHGCall-0.65	Uall-1.90	SHGCall-NR
	2.1-5.0%	Uall-1.90	SHGCall-0.39	Uall-1.90	SHGCall-0.34	Uall-1.90	SHGCall-NR
Skylight without Curb, All,% of Roof							
	0-2.0%	Uall-1.36	SHGCall-0.61	Uall-1.36	SHGCall-0.39	Uall-1.36	SHGCall-NR
	2.1-5.0%	Uall-1.36	SHGCall-0.39	Uall-1.36	SHGCall-0.19	Uall-1.36	SHGCall-NR

Table 12: Proposed building envelope requirements for climate zone 4(A,B,C)

TABLE 5.5-4
Building Envelope Requirements For Climate Zone 4 (A,B,C)

		Nonresidential		**Residential**		**Semiheated**	
	Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs							
	Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.218	R-3.8 ci
	Metal Building[a]	~~U-0.065~~ U-0.055	~~R-19.0~~ R-13.0 + R-13.0	~~U-0.065~~ U-0.055	~~R-19.0~~ R-13.0 + R-13.0	U-0.097	R-10.0
	Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.081	R-13.0
Walls, Above Grade							
	Mass	U-0.151[ab]	R-5.7 ci[ab]	U-0.104	R-9.5 ci	U-0.580	NR
	Metal Building	~~U-0.113~~ U-0.084	~~R-13.0~~ R-19.0	~~U-0.113~~ U-0.084	~~R-13.0~~ R-19.0	U-0.134	R-10.0
	Steel Framed	U-0.124	R-13.0	U-0.064	R-13.0 + R-7.5 ci	U-0.124	R-13.0
	Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.089	R-13.0
Wall, Below Grade							
	Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors							
	Mass	U-0.107	R-6.3 ci	U-0.087	R-8.3 ci	U-0.322	NR
	Steel Joist	U-0.052	R-19.0	U-0.038	R-30.0	U-0.069	R-13.0
	Wood Framed and Other	U-0.051	R-19.0	U-0.033	R-30.0	U-0.066	R-13.0
Slab-On-Grade Floors							
	Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
	Heated	F-0.950	R-7.5 for 24 in.	F-0.840	R-10 for 36 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors							
	Swinging	U-0.700		U-0.700		U-0.700	
	Non-Swinging	U-1.450		U-0.500		U-1.450	
	Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall							
	0-10.0%	Ufixed-0.57	SHGCall-0.39	Ufixed-0.57	SHGCall-0.39	Ufixed-1.22	SHGCall-NR
		Uoper-0.67	SHGCnorth-0.49	Uoper-0.67	SHGCnorth-0.49	Uoper-1.27	SHGCnorthNR
	10.1-20.0%	Ufixed-0.57	SHGCall-0.39	Ufixed-0.57	SHGCall-0.39	Ufixed-1.22	SHGCall-NR
		Uoper-0.67	SHGCnorth-0.49	Uoper-0.67	SHGCnorth-0.49	Uoper-1.27	SHGCnorthNR
	20.1-30.0%	Ufixed-0.57	SHGCall-0.39	Ufixed-0.57	SHGCall-0.39	Ufixed-1.22	SHGCall-NR
		Uoper-0.67	SHGCnorth-0.49	Uoper-0.67	SHGCnorth-0.49	Uoper-1.27	SHGCnorthNR
	30.1-40.0%	Ufixed-0.57	SHGCall-0.39	Ufixed-0.57	SHGCall-0.39	Ufixed-1.22	SHGCall-NR
		Uoper-0.67	SHGCnorth-0.49	Uoper-0.67	SHGCnorth-0.49	Uoper-1.27	SHGCnorthNR
	40.1-50.0%	Ufixed-0.46	SHGCall-0.25	Ufixed-0.46	SHGCall-0.25	Ufixed-0.98	SHGCall-NR
		Uoper-0.47	SHGCnorth-0.36	Uoper-0.47	SHGCnorth-0.36	Uoper-1.02	SHGCnorthNR
Skylight with Curb, Glass,% of Roof							
	0-2.0%	Uall-1.17	SHGCall-0.49	Uall-0.98	SHGCall-0.36	Uall-1.98	SHGCall-NR
	2.1-5.0%	Uall-1.17	SHGCall-0.39	Uall-0.98	SHGCall-0.19	Uall-1.98	SHGCall-NR
Skylight with Curb, Plastic,% of Roof							
	0-2.0%	Uall-1.30	SHGCall-0.65	Uall-1.30	SHGCall-0.62	Uall-1.90	SHGCall-NR
	2.1-5.0%	Uall-1.30	SHGCall-0.34	Uall-1.30	SHGCall-0.27	Uall-1.90	SHGCall-NR
Skylight without Curb, All,% of Roof							
	0-2.0%	Uall-0.69	SHGCall-0.49	Uall-0.58	SHGCall-0.36	Uall-1.36	SHGCall-NR
	2.1-5.0%	Uall-0.69	SHGCall-0.39	Uall-0.58	SHGCall-0.19	Uall-1.36	SHGCall-NR

[a] When using R-value compliance method, a thermal spacer block is required, otherwise use the U-Factor compliance method. See Table A2.3.

[ab] Exception to A3.1.3.1 applies.

Table 13: Proposed building envelope requirements for climate zone 5(A,B,C)

TABLE 5.5-5
Building Envelope Requirements For Climate Zone 5 (A,B,C)

	Nonresidential		Residential		Semiheated	
Opaque Elements	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**	**Assembly Maximum**	**Insulation Min. R-Value**
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.173	R-5.0 ci
Metal Building[a]	~~U-0.065~~ U-0.055	~~R-19.0~~ R-13.0 + R-13.0	~~U-0.065~~ U-0.055	~~R-19.0~~ R-13.0 + R-13.0	~~U-0.097~~ U-0.083	~~R-10.0~~ R-13.0
Attic and Other	U-0.034	R-30.0	U-0.027	R-38.0	U-0.053	R-19.0
Walls, Above Grade						
Mass	U-0.123	R-7.6 ci	U-0.090	R-11.4 ci	U-0.580	NR
Metal Building	~~U-0.113~~ U-0.069	~~R-13.0~~ R-13.0 + R 5.6ci	~~U-0.057~~ U-0.069	~~R-13.0 + R-13.0~~ R-13.0 + R 5.6 ci	~~U-0.123~~ U-0.113	~~R-11.0~~ R-13.0
Steel Framed	U-0.084	R-13.0 + R-3.8 ci	U-0.064	R-13.0 + R-7.5 ci	U-0.124	R-13.0
Wood Framed and Other	U-0.089	R-13.0	U-0.089	R-13.0	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-1.140	NR	C-1.140	NR	C-1.140	NR
Floors						
Mass	U-0.087	R-8.3 ci	U-0.074	R-10.4 ci	U-0.322	NR
Steel Joist	U-0.052	R-19.0	U-0.038	R-30.0	U-0.069	R-13.0
Wood Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-0.066	R-13.0
Slab-On-Grade Floors						
Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
Heated	F-0.840	R-10 for 36 in.	F-0.840	R-10 for 36 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors						
Swinging	U-0.700		U-0.700		U-0.700	
Non-Swinging	U-1.450		U-0.500		U-1.450	
Fenestration	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**	**Assembly Max. U (Fixed/ Operable)**	**Assembly Max. SHGC (All Orientations/ North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-0.57	$SHGC_{all}$-0.49	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$-NR
10.1-20.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$-NR
20.1-30.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$-NR
30.1-40.0%	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-0.57	$SHGC_{all}$-0.39	U_{fixed}-1.22	$SHGC_{all}$-NR
	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-0.67	$SHGC_{north}$-0.49	U_{oper}-1.27	$SHGC_{north}$-NR
40.1-50.0%	U_{fixed}-0.46	$SHGC_{all}$-0.26	U_{fixed}-0.46	$SHGC_{all}$-0.36	U_{fixed}-0.98	$SHGC_{all}$-NR
	U_{oper}-0.47	$SHGC_{north}$-0.36	U_{oper}-0.47	$SHGC_{north}$-0.49	U_{oper}-1.02	$SHGC_{north}$-NR
Skylight with Curb, Glass,% of Roof						
0-2.0%	U_{all}-1.17	$SHGC_{all}$-0.49	U_{all}-1.17	$SHGC_{all}$-0.49	U_{all}-1.98	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.17	$SHGC_{all}$-0.39	U_{all}-1.17	$SHGC_{all}$-0.39	U_{all}-1.98	$SHGC_{all}$-NR
Skylight with Curb, Plastic,% of Roof						
0-2.0%	U_{all}-1.30	$SHGC_{all}$-0.77	U_{all}-1.30	$SHGC_{all}$-0.77	U_{all}-1.90	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-1.30	$SHGC_{all}$-0.62	U_{all}-1.30	$SHGC_{all}$-0.62	U_{all}-1.90	$SHGC_{all}$-NR
Skylight without Curb, All,% of Roof						
0-2.0%	U_{all}-0.69	$SHGC_{all}$-0.49	U_{all}-0.69	$SHGC_{all}$-0.49	U_{all}-1.36	$SHGC_{all}$-NR
2.1-5.0%	U_{all}-0.69	$SHGC_{all}$-0.39	U_{all}-0.69	$SHGC_{all}$-0.39	U_{all}-1.36	$SHGC_{all}$-NR

[a] When using R-value compliance method, a thermal spacer block is required, otherwise use the U-Factor compliance method. See Table A2.3.

Table 14: Proposed building envelope requirements for climate zone 6(A,B)

TABLE 5.5-6
Building Envelope Requirements For Climate Zone 6 (A,B)

	Nonresidential		Residential		Semiheated	
Opaque Elements	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.173	R-5.0 ci
Metal Building[a]	~~U-0.065~~ U-0.049	~~R-19.0~~ R-13.0 + R-19.0	~~U-0.065~~ U-0.049	~~R-19.0~~ R-13.0 + R-19.0	~~U-0.097~~ U-0.072	~~R-10.0~~ R-16.0
Attic and Other	U-0.027	R-38.0	U-0.027	R-38.0	U-0.053	R-19.0
Walls, Above Grade						
Mass	U-0.104	R-9.5 ci	U-0.090	R-11.4 ci	U-0.580	NR
Metal Building	~~U-0.113~~ U-0.069	~~R-13.0~~ R-13.0 + R 5.6 ci	~~U-0.057~~ U-0.069	~~R-13.0 + R-13.0~~ R-13.0 + R 5.6 ci	U-0.113	R-13.0
Steel Framed	U-0.084	R-13.0 + R-3.8 ci	U-0.064	R-13.0 + R-7.5 ci	U-0.124	R-13.0
Wood Framed and Other	U-0.089	R-13.0	U-0.064	R-13.0 + R-3.8 ci	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-1.140	NR	C-0.119	R-7.5 ci	C-1.140	NR
Floors						
Mass	U-0.087	R-8.3 ci	U-0.064	R-12.5 ci	U-0.322	NR
Steel Joist	U-0.038	R-30.0	U-0.038	R-30.0	U-0.069	R-13.0
Wood Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-.0066	R-13.0
Slab-On-Grade Floors						
Unheated	F-0.730	NR	F-0.730	NR	F-0.730	NR
Heated	F-0.840	R-10 for 36 in.	F-0.780	R-10 for 48 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors						
Swinging	U-0.700		U-0.500		U-0.700	
Non-Swinging	U-0.500		U-0.500		U-1.450	
Fenestration	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)
Vertical Glazing,% of Wall						
0-10.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
10.1-20.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
20.1-30.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
30.1-40.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
40.1-50.0%	$^{U}\text{fixed}^{-0.46}$	$^{SHGC}\text{all}^{-0.26}$	$^{U}\text{fixed}^{-0.46}$	$^{SHGC}\text{all}^{-0.26}$	$^{U}\text{fixed}^{-0.98}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.47}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-0.47}$	$^{SHGC}\text{north}^{-0.49}$	$^{U}\text{oper}^{-1.02}$	$^{SHGC}\text{north}^{NR}$
Skylight with Curb, Glass,% of Roof						
0-2.0%	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{all}^{-0.98}$	$^{SHGC}\text{all}^{-0.46}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-NR}$
2.1-5.0%	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{all}^{-0.98}$	$^{SHGC}\text{all}^{-0.36}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-NR}$
Skylight with Curb, Plastic,% of Roof						
0-2.0%	$^{U}\text{all}^{-0.87}$	$^{SHGC}\text{all}^{-0.71}$	$^{U}\text{all}^{-0.74}$	$^{SHGC}\text{all}^{-0.65}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-NR}$
2.1-5.0%	$^{U}\text{all}^{-0.87}$	$^{SHGC}\text{all}^{-0.58}$	$^{U}\text{all}^{-0.74}$	$^{SHGC}\text{all}^{-0.55}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-NR}$
Skylight without Curb, All,% of Roof						
0-2.0%	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{all}^{-0.58}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-NR}$
2.1-5.0%	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{all}^{-0.58}$	$^{SHGC}\text{all}^{-0.39}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-NR}$

[a] When using R-value compliance method, a thermal spacer block is required, otherwise use the U-Factor compliance method. See Table A2.3.

Table 15: Proposed building envelope requirements for climate zone 7

TABLE 5.5-7
Building Envelope Requirements For Climate Zone 7

	Nonresidential		Residential		Semiheated	
	Assembly	Insulation Min.	Assembly	Insulation Min.	Assembly	Insulation Min.
Opaque Elements	**Maximum**	**R-Value**	**Maximum**	**R-Value**	**Maximum**	**R-Value**
Roofs						
Insulation Entirely above Deck	U-0.063	R-15.0 ci	U-0.063	R-15.0 ci	U-0.173	R-5.0 ci
Metal Building[a]	~~U-0.065~~ U-0.049	~~R-19.0~~ R-13.0 + R-19.0	~~U-0.065~~ U-0.049	~~R-19.0~~ R-13.0 + R-19.0	~~U-0.097~~ U-0.072	~~R-10.0~~ R-16.0
Attic and Other	U-0.027	R-38.0	U-0.027	R-38.0	U-0.053	R-19.0
Walls, Above Grade						
Mass	U-0.090	R-11.4 ci	U-0.080	R-13.3 ci	U-0.580	NR
Metal Building	U-0.057	~~R-13.0 + R-13.0~~ R-19.0 + R 5.6 ci	U-0.057	~~R-13.0 + R-13.0~~ R-19.0 + R 5.6 ci	U-0.113	R-13.0
Steel Framed	U-0.064	R-13.0 + R-7.5 ci	U-0.064	R-13.0 + R-7.5 ci	U-0.124	R-13.0
Wood Framed and Other	U-0.089	R-13.0	U-0.051	R-13.0 + R-7.5 ci	U-0.089	R-13.0
Wall, Below Grade						
Below Grade Wall	C-0.119	R-7.5 ci	C-0.119	R-7.5 ci	C-1.140	NR
Floors						
Mass	U-0.087	R-8.3 ci	U-0.064	R-12.5 ci	U-0.137	R-4.2 ci
Steel Joist	U-0.038	R-30.0	U-0.038	R-30.0	U-0.052	R-19.0
Wood Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-0.066	R-13.0
Slab-On-Grade Floors						
Unheated	F-0.730	NR	F-0.540	R-10 for 24 in.	F-0.730	NR
Heated	F-0.840	R-10 for 36 in.	F-0.780	R-10 for 48 in.	F-1.020	R-7.5 for 12 in.
Opaque Doors						
Swinging	U-0.700		U-0.500		U-0.700	
Non-Swinging	U-0.500		U-0.500		U-1.450	
	Assembly	Assembly Max.	Assembly	Assembly Max.	Assembly	Assembly Max.
	Max. U	SHGC (All	Max. U	SHGC (All	Max. U	SHGC (All
	(Fixed/	Orientations/	(Fixed/	Orientations/	(Fixed/	Orientations/
Fenestration	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**	**Operable)**	**North-Oriented)**
Vertical Glazing,% of Wall						
0-10.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
10.1-20.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
20.1-30.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
30.1-40.0%	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-0.57}$	$^{SHGC}\text{all}^{-0.49}$	$^{U}\text{fixed}^{-1.22}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-0.67}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-1.27}$	$^{SHGC}\text{north}^{NR}$
40.1-50.0%	$^{U}\text{fixed}^{-0.46}$	$^{SHGC}\text{all}^{-0.36}$	$^{U}\text{fixed}^{-0.46}$	$^{SHGC}\text{all}^{-0.36}$	$^{U}\text{fixed}^{-0.98}$	$^{SHGC}\text{all}^{-NR}$
	$^{U}\text{oper}^{-0.47}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-0.47}$	$^{SHGC}\text{north}^{-0.64}$	$^{U}\text{oper}^{-1.02}$	$^{SHGC}\text{north}^{NR}$
Skylight with Curb, Glass,% of Roof						
0-2.0%	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.68}$	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.64}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-NR}$
2.1-5.0%	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.64}$	$^{U}\text{all}^{-1.17}$	$^{SHGC}\text{all}^{-0.64}$	$^{U}\text{all}^{-1.98}$	$^{SHGC}\text{all}^{-NR}$
Skylight with Curb, Plastic,% of Roof						
0-2.0%	$^{U}\text{all}^{-0.87}$	$^{SHGC}\text{all}^{-0.77}$	$^{U}\text{all}^{-0.61}$	$^{SHGC}\text{all}^{-0.77}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-NR}$
2.1-5.0%	$^{U}\text{all}^{-0.87}$	$^{SHGC}\text{all}^{-0.71}$	$^{U}\text{all}^{-0.61}$	$^{SHGC}\text{all}^{-0.77}$	$^{U}\text{all}^{-1.90}$	$^{SHGC}\text{all}^{-NR}$
Skylight without Curb, All,% of Roof						
0-2.0%	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.68}$	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.64}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-NR}$
2.1-5.0%	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.64}$	$^{U}\text{all}^{-0.69}$	$^{SHGC}\text{all}^{-0.64}$	$^{U}\text{all}^{-1.36}$	$^{SHGC}\text{all}^{-NR}$

[a] When using R-value compliance method, a thermal spacer block is required, otherwise use the U-Factor compliance method. See Table A2.3.

Table 16: Proposed building envelope requirements for climate zone 8

TABLE 5.5-8
Building Envelope Requirements For Climate Zone 8

		Nonresidential		Residential		Semiheated	
	Opaque Elements	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
Roofs							
	Insulation Entirely above Deck	U-0.048	R-20.0 ci	U-0.048	R-20.0 ci	U-0.093	R-10.0 ci
	Metal Building[a]	~~U-0.049~~ U-0.035	~~R-13.0 + R-19.0~~ R-11.0 + R-19.0 ls	~~U-0.049~~ U-0.035	~~R-13.0 + R-19.0~~ R-11.0 + R-19.0 ls	~~U-0.072~~ U-0.065	~~R-16.0~~ R-19.0
	Attic and Other	U-0.027	R-38.0	U-0.027	R-38.0	U-0.034	R-30.0
Walls, Above Grade							
	Mass	U-0.080	R-13.3 ci	U-0.071	R-15.2 ci	U-0.151[~~a~~b]	R-5.7 ci[~~a~~b]
	Metal Building	U-0.057	~~R-13.0 + R-13.0~~ R-19.0 + R 5.6 ci	U-0.057	~~R-13.0 + R-13.0~~ R-19.0 + R 5.6 ci	U-0.113	R-13.0
	Steel Framed	U-0.064	R-13.0 + R-7.5 ci	U-0.055	R-13.0 + R-10.0 ci	U-0.124	R-13.0
	Wood Framed and Other	U-0.051	R-13.0 + R-7.5 ci	U-0.051	R-13.0 + R-7.5 ci	U-0.089	R-13.0
Wall, Below Grade							
	Below Grade Wall	C-0.119	R-7.5 ci	C-0.119	R-7.5 ci	C-1.140	NR
Floors							
	Mass	U-0.064	R-12.5 ci	U-0.057	R-14.6 ci	U-0.137	R-4.2 ci
	Steel Joist	U-0.038	R-30.0	U-0.032	R-38.0	U-0.052	R-19.0
	Wood Framed and Other	U-0.033	R-30.0	U-0.033	R-30.0	U-0.051	R-19.0
Slab-On-Grade Floors							
	Unheated	F-0.540	R-10 for 24 in.	F-0.520	R-15 for 24 in.	F-0.730	NR
	Heated	F-0.780	R-10 for 48 in.	F-0.780	R-10 for 48 in.	F-0.950	R-7.5 for 24 in.
Opaque Doors							
	Swinging	U-0.500		U-0.500		U-0.700	
	Non-Swinging	U-0.500		U-0.500		U-1.450	
	Fenestration	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)	Assembly Max. U (Fixed/ Operable)	Assembly Max. SHGC (All Orientations/ North-Oriented)
Vertical Glazing,% of Wall							
	0-10.0%	Ufixed-0.46	SHGCall-NR	Ufixed-0.46	SHGCall-NR	Ufixed-1.22	SHGCall-NR
		Uoper-0.47	SHGCnorth-NR	Uoper-0.47	SHGCnorth-NR	Uoper-1.27	SHGCnorthNR
	10.1-20.0%	Ufixed-0.46	SHGCall-NR	Ufixed-0.46	SHGCall-NR	Ufixed-1.22	SHGCall-NR
		Uoper-0.47	SHGCnorth-NR	Uoper-0.47	SHGCnorth-NR	Uoper-1.27	SHGCnorthNR
	20.1-30.0%	Ufixed-0.46	SHGCall-NR	Ufixed-0.46	SHGCall-NR	Ufixed-1.22	SHGCall-NR
		Uoper-0.47	SHGCnorth-NR	Uoper-0.47	SHGCnorth-NR	Uoper-1.27	SHGCnorthNR
	30.1-40.0%	Ufixed-0.46	SHGCall-NR	Ufixed-0.46	SHGCall-NR	Ufixed-1.22	SHGCall-NR
		Uoper-0.47	SHGCnorth-NR	Uoper-0.47	SHGCnorth-NR	Uoper-1.27	SHGCnorthNR
	40.1-50.0%	Ufixed-0.35	SHGCall-NR	Ufixed-0.35	SHGCall-NR	Ufixed-0.98	SHGCall-NR
		Uoper-0.39	SHGCnorth-NR	Uoper-0.39	SHGCnorth-NR	Uoper-1.02	SHGCnorthNR
Skylight with Curb, Glass,% of Roof							
	0-2.0%	Uall-0.98	SHGCall-NR	Uall-0.98	SHGCall-NR	Uall-1.30	SHGCall-NR
	2.1-5.0%	Uall-0.98	SHGCall-NR	Uall-0.98	SHGCall-NR	Uall-1.30	SHGCall-NR
Skylight with Curb, Plastic,% of Roof							
	0-2.0%	Uall-0.61	SHGCall-NR	Uall-0.61	SHGCall-NR	Uall-1.10	SHGCall-NR
	2.1-5.0%	Uall-0.61	SHGCall-NR	Uall-0.61	SHGCall-NR	Uall-1.10	SHGCall-NR
Skylight without Curb, All,% of Roof							
	0-2.0%	Uall-0.58	SHGCall-NR	Uall-0.58	SHGCall-NR	Uall-0.81	SHGCall-NR
	2.1-5.0%	Uall-0.58	SHGCall-NR	Uall-0.58	SHGCall-NR	Uall-0.81	SHGCall-NR

[a] When using R-value compliance method, a thermal spacer block is required, otherwise use the U-Factor compliance method. See Table A2.3.

[~~a~~b] Exception to A3.1.3.1 applies.

Table 17: Proposed assembly U-values for metal building roofs

TABLE A2.3 Assembly U-Factors for Metal Building Roofs

Insulation System	Rated R-Value of Insulation	Total Rated R-Value of Insulation	Overall U-Factor for Entire Base Roof Assembly	Overall U-Factor for Assembly of Base Roof Plus Continuous Insulation (uninterrupted by framing) — Rated R-Value of Continuous Insulation					
				R-5.6	R-11.2	R-16.8	R-22.4	R-28.0	R-33.6
Standing Seam Roofs with Thermal Spacer Blocks									
Single	None	0	1.280	~~0.162~~ 0.157	~~0.087~~ 0.083	~~0.059~~ 0.057	~~0.045~~ 0.043	~~0.036~~ 0.035	~~0.030~~ 0.029
Layer	R-6	6	**0.167**	0.086	0.058	0.044	0.035	0.029	0.025
	R-10	10	**0.097**	0.063	0.046	0.037	0.031	0.026	0.023
	R-11	11	**0.092**	0.061	0.045	0.036	0.030	0.026	0.022
	R-13	13	**0.083**	0.057	0.043	0.035	0.029	0.025	0.022
	R-16	16	**0.072**	0.051	0.040	0.033	0.028	0.024	0.021
	R-19	19	**0.065**	0.048	0.038	0.031	0.026	0.023	0.020
Double	R-10 + R-10	20	**0.063**	0.047	0.037	0.031	0.026	0.023	0.020
Layer	R-10 + R-11	21	**0.061**	0.045	0.036	0.030	0.026	0.023	0.020
	R-11 + R-11	22	**0.060**	0.045	0.036	0.030	0.026	0.022	0.020
	R-10 + R-13	23	**0.058**	0.044	0.035	0.029	0.025	0.022	0.020
	R-11 + R-13	24	**0.057**	0.043	0.035	0.029	0.025	0.022	0.020
	R-13 + R-13	26	**0.055**	0.042	0.034	0.029	0.025	0.022	0.019
	R-10 + R-19	29	**0.052**	0.040	0.033	0.028	0.024	0.021	0.019
	R-11 + R-19	30	**0.051**	0.040	0.032	0.027	0.024	0.021	0.019
	R-13 + R-19	32	**0.049**	0.038	0.032	0.027	0.023	0.021	0.019
	R-16 + R-19	35	**0.047**	0.037	0.031	0.026	0.023	0.020	0.018
	R-19 + R-19	38	**0.046**	0.037	0.030	0.026	0.023	0.020	0.018
Liner	R-11+R-19	30	0.035						
System	R-11+R-25	36	0.031						
	R-11+R-30	41	0.029						
	R-11+R-11+R25	47	0.026						
Standing Seam Roofs without Thermal Spacer Blocks									
Liner System	R-11+R-19	30	0.040	0.033	0.028	0.024	0.021	0.019	0.017
Filled Cavity with Thermal Spacer Blocks									
	R-19 + R-10	29	**0.041**	0.033	0.028	0.024	0.021	~~0.020~~ 0.019	0.017
(Multiple R-values are listed in order from inside to outside)									
Thru-Fastened Roofs without Thermal Spacer Blocks									
	R-10	10	**0.153**						
	R-11	11	**0.139**						
	R-13	13	**0.130**						
	R-16	16	**0.106**						
	R-19	19	**0.098**						
Liner System	R-11+R-19	30	0.044						

Table 18: Proposed assembly U-values for metal building walls

TABLE A3.2 Assembly U-Factors for Metal Building Walls

Insulation System	Rated R-Value of Insulation	Total Rated R-Value of Insulation	Overall U-Factor for Entire Base Wall Assembly	Overall U-Factor for Assembly of Base Wall Plus Continuous Insulation (uninterrupted by framing) Rated R-Value of Continuous Insulation					
				R-5.6	R-11.2	R-16.8	R-22.4	R-28.0	R-33.6
Single Layer of Mineral Fiber									
	None	0	1.180	0.161	0.086	0.059	0.045	0.036	0.030
	R-6	6	0.184	0.091	0.060	0.045	0.036	0.030	0.026
	R-10	10	0.134	0.077	0.054	0.051	0.033	0.028	0.024
	R-11	11	0.123	0.073	0.052	0.040	0.033	0.028	0.024
	R-13	13	0.113	0.069	0.050	0.039	0.032	0.027	0.024
	R-16	16	0.093	0.061	0.046	0.036	0.030	0.026	0.023
	R-19	19	0.084	0.057	0.043	0.035	0.029	0.025	0.022
Double Layer of Mineral Fiber (Second layer inside of girts) (Multiple layers are listed in order from inside to outside)									
	R-6 + R-13	19	0.070	N/A	N/A	N/A	N/A	N/A	N/A
	R-10 + R-13	23	0.061	N/A	N/A	N/A	N/A	N/A	N/A
	R-13 + R-13	26	0.057	N/A	N/A	N/A	N/A	N/A	N/A
	R-19 + R-13	32	0.048	N/A	N/A	N/A	N/A	N/A	N/A

4. Response to the formal interpretation request from Christian Cianfrone of the requirements in Standard 90.1-2004, Sections 5.5.3 and A3.3.2.3, regarding the insulation of opaque mullions in spandrel glass. The interpretation states that although it is in contrast to industry practice and increases the condensation potential of the curtain wall system, it is necessary to wrap the mullions with insulation at the spandrel area in order to comply with the building envelope prescriptive requirements of Standard 90.1.
5. Discussed addendum xx. These changes modify the requirements of 90.1 so as not to create condensation concerns in assemblies. The first change deletes the words “with the inside surface”, because that is a bad choice to make in walls where convection currents may be created by an air gap between the insulation and the sheathing; gaps between insulation boards also promote short-circuiting the insulation. The Appendix A paragraph deletion is due to condensation concerns on aluminum mullions. Aluminum mullions are thermally broken, and depend on receiving heat from the interior heated space to remain above the dew-point of the indoor air.
6. Addendum f to 90.1-2007 discussed. The addendum deals with cool roofs and roof insulation. Specifications for roof surface properties roofs in all climate zones. Further specifications of modeling aged values are provided.
7. Addenda to 90.1-2004 discussed:
   - 90.1c: revise vestibule applications (5.4.3.4)
   - 90.1d: updating of references (12)
   - 90.1k & al: add metal bldg roof U-factors (A2.3)
   - 90.1n & av: glass/slatted overhangs (5.5.4.4.1)
   - 90.1o: add 368 China & 38 Taiwan sites (App D)
   - 90.1y, ad & aj: cool roof stds, labels (5.5.3.1)
   - 90.1as: update opaque criteria (Table 5.5-1 to 8)
   - 90.1at: update fenestration criteria (T 5.5-1 to 8)

8. Discussion on minimum visible transmittance to be included as part of the process for developing the vertical fenestration criteria, so that the benefits of reduced electric lighting due to daylighting may be considered. – However the addendum was rejected on 22ndd June 07 on the grounds of it being difficult to achieve.

5.2.3.5 From ECB

1. Proposal to create a working group to define standard building types. Currently NREL has 22 building types modeled in EnergyPlus building program, DOE/LBL has 15 prototypes.
2. Discussing the comments from Addendum r which is out for public review. Addendum r changes informative Appendix G's performance rating method into normative appendix. Making the performance rating method normative or required would allow its adoption into advanced energy standards such as proposed standard 189P, Standard for the design of high performance green buildings to make appendix G enforceable allowing adoption by model codes. Some language was changed to facilitate this change.
3. Discussion of the interpretation to the exceptional calculation method as proposed in Appendix G. This request for interpretation refers to the requirements presented in ANSI/ASHRAE/IESNA Standard 90.1 2004 sections G2.2, G2.5 and G3.1 regarding the application of exceptional calculation methods and nonstandard efficiency measures to model energy for systems utilizing elevated air speed to increase the maximum temperature for acceptable comfort.
4. Considering revisions to Combined Heating and Power / District heating and cooling – Proposed changes. Proposed addition to section for purchase for purchased heat with addition of boilers in the 1st section and section G3.1.1.2 Purchased Chilled Water wherein specifications of purchased chilled water are outlined.

5.2.3.6 From Mechanical Subcommittee

1. Energy Recovery: The current code states that individual fan systems that have both a design supply air capacity of 5000cfm or greater and have a minimum outdoor air supply of 70% or greater of the design supply air quality shall have an energy recovery system with at least 50% recovery effectiveness. Fifty percent energy recovery effectiveness shall mean a change in the enthalpy of the outdoor air supply equal to 50% of the difference between the outdoor air and return air at design conditions. Provision shall be made to bypass or control the heat recovery system to permit air economizer operation as required by 6.5.1.1.Certain exceptions apply.

   As per the proposal the energy recovery systems shall have at least 50% recovery effectiveness per table 6.5.6.1B. Provision shall be made for all outdoor, exhaust, and supply air to bypass the energy recovery device when the system has an economizer or during periods when use of the device would increase the energy consumption of the system. Where a single room or space is supplied by multiple units, the aggregate supply cfm of those units shall be used in applying this requirement. The system shall meet the energy recovery requirements of Table 6.5.6.1A. Table 19and Table 20 present Table 6.5.6.1A and Table 6.5.6.1B respectively.

   The proposal was updated to reflect the effects of low leaving air temperature and the analysis was deemed acceptable. Energy analysis was reviewed and accepted in principle. Some discussion on the effect of low supply air temperature in heating was held. Due to the tool that was developed, the model will be revised to reflect those effects before submission to the full committee. The proposal wording underwent small modification and will be submitted to the full committee for approval at this meeting.

Table 19: Proposed Table 6.5.6.1A- Specifications for Energy Recovery Requirements

Zone	% Outside Air at full design cfm					
	≥30% and < 40%	≥40% and < 50%	≥50% and < 60%	≥60% and < 70%	≥70% and < 80%	≥80%
	Design Supply Fan CFM					
3C,4C	NR	NR	NR	≥27000	≥17000	≥9000
2B,3B,4B,5B	NR	≥16500	≥9500	≥5500	≥4500	≥4000
3A,4A	≥5500	≥4500	≥4000	≥3500	≥2000	≥1000
1A,2A, 5A, 6A, 6B	≥4000	≥3500	≥2500	≥1500	>0	>0
7,8	>0	>0	>0	>0	>0	>0

Table 20: Proposed Table 6.5.6.1 B Performance Requirement for Energy Recovery Equipment

Table 6.5.6.1 B Performance Requirement for Energy Recovery Equipment (IP)

Equipment Type	Application	Rating Condition	Performance Required	Test Procedure
Energy Recovery	Cooling	95°F DB/78°F WB	≥ 50%Total Effectiveness	ARI 1060
Energy Recovery	Heating	35°F DB/33°F WB	≥ 50% Total Effectiveness	ARI 1060

2. Pipe sizing: New requirements have been added for pipe sizing specifications. The new requirements will be listed in Section 6.5.4.6 of the updated standard. The addition is as follows :

   6.5.4.6 Pipe sizing All HVAC chilled water and condenser water piping systems shall be designed such that the fluid flow in L/s (gpm) in each pipe segment shall not exceed the values listed in Table 7.4.3-5 for the appropriate total annual hours of operation.Pipe size selections for systems that operate under variable flow conditions are allowed to be made from the “Variable Flow/ Constant Speed” column. Pipe sizeselections for systems that operate under variable flow conditions and that contain variable frequency drive pump motors are allowed to be made from the “Variable Flow/Variable Speed” columns. All others shall be made from the “Constant Flow/Constant Speed” columns.

   The proposed piping system design maximum flow rate in GPM is provided in Table 21.

Table 21: Proposed Table 7.4.3.6 Piping System Design Maximum Flow Rate

Table 7.4.3-5: Piping System Design Maximum Flow Rate in GPM (IP)

	<=2000 hours/yr			<=4400 hours/year			<=8760 hours/year		
Nominal Pipe Size (in.)	Constant Flow/ Constant Speed	Variable Flow/ Constant Speed	Variable Flow/ Variable Speed	Constant Flow/ Constant Speed	Variable Flow/ Constant Speed	Variable Flow/ Variable Speed	Constant Flow/ Constant Speed	Variable Flow/ Constant Speed	Variable Flow/ Variable Speed
½	3.5	4.1	5.2	2.6	3.1	3.9	2.0	2.4	3.2
¾	7.7	9.2	11	5.8	7.0	8.8	4.6	5.5	6.9
1	13	15	20	10	12	15	7.9	9.5	12
1-1/4	19	22	29	14	17	22	11	13	17
1-1/2	29	35	44	22	27	34	17	21	26
2	65	77	98	49	59	74	39	46	59
2-1/2	76	90	110	58	69	87	46	54	69
3	150	180	220	110	130	170	91	110	130
4	280	330	420	210	250	320	170	200	250
5	330	400	510	250	300	380	200	240	300
6	580	690	880	440	530	670	350	410	530
8	780	920	1200	590	710	890	460	560	700
10	1400	1700	2200	1000	1300	1600	850	1000	1300
12	1900	2300	3000	1400	1700	2200	1100	1300	1700
14	3300	3900	5000	2400	3000	3800	1900	2300	3000
16	4100	4900	6200	3100	3700	4700	2400	2900	3700
18	5600	6600	8400	4300	5000	6400	3300	4000	5000
20	6200	7300	9300	4700	5600	7100	3700	4400	5600
24	9200	11000	14000	7000	8400	10000	5500	6600	8400
26	12000	14000	18000	9300	11000	14000	7300	8700	11000
30	17000	19000	25000	12000	15000	18000	10000	12000	15000

3. Data Centers: In the year 2005, data processing environments were estimated to consume approximately 1.2% of the total electricity in the United States. Benchmarking by Lawrence Berkeley National Laboratory has shown that the ratio of HVAC energy to the server load can vary from as little as 30% to as large as 200% . Research on DC power, high efficiency UPS systems and efficient power supplies have shown that there are significant potential savings from standard electrical practices. These are all complex issues that are compounded by the rapid rate of product development in the data center industry. SSPC needs the resources and experience of TC 9.9 to guide us to reasonable metrics and measures that could improve the current state of design. An RTAR was recommended to be sponsored from ASHRAETC9.9 titled "The need for humidification in Data Centers". Also, The MSC recommends that SSPC 90.1 request that TC 9.9, "Mission Critical Facilities," provide us with technical assistance on development of minimum efficiency measures (either prescriptive or performance based) for the equipment and systems serving data processing environments to be included in ASHRAE/IESNA Standard 90.1-2010. The SSPC-90.1 further requests a proposed time table be provided to SSPC 90.1 by October 11th, 2007 (our mid-quarter meeting) from TC 9.9 for the development of a code change proposal.

4. Code changes for Single Zone VAV proposal. This code change proposal presents a new mandatory requirement for variable air volume control of unitary systems with two stages of cooling capacity (10 tons and above). Compliance can be met with either 2-speed motors or variable speed drives. This change has been reviewed by and received the support of ARI's Unitary Large Engineering (ULE) Group. By agreement with the manufacturers, this measure will not take effect until 1/1/2012.
   This proposed measure is a new mandatory requirement. It would add a new requirement to Section 6.4 (Mandatory Provisions) and a corresponding paragraph in Section 6.3 (Simplified Approach). It would apply to new or replacement unitary and air-handling equipment.In addition to these changes, the base case single zone non-residential HVAC budget systems 5, 6, 7, 9 and 11 should be modified in the ECB effective 1/1/2012.

5. Cooling Towers: New TC 8.6 supported MSC CMP to identify efficiencies/standard on closed Cooling Towers. A motion was moved to have a proposal for regulations with values for closed towers. It was proposed that closed circuit cooling tower minimum efficiency requirements be included in Table 6.8.1G. Centrfugal fan limitations. Cooling tower control. Table 22 and Table 23 present the current performance requirements and the proposed performance requirements respectively.

Table 22: Current Performance Requirements for Heat Rejection Equipment (per open circuit cooling tower addendum to 90.1 – 2004)

Equipment Type[d]	Total System Heat Rejection Capacity at Rated Conditions	Subcategory or Rating Condition	Performance Required[a,b]	Test Procedure[c]
Propeller or Axial Fan Open Cooling Towers	All	95°F Entering Water 85°F Leaving Water 75°F wb *Outdoor air*	≥38.2 gpm/hp	CTI ATC-105 and CTI STD-201
Centrifugal Fan Open Cooling Towers	All	95°F Entering Water 85°F Leaving Water 75°F wb *Outdoor air*	≥20.0 gpm/hp	CTI ATC-105 and CTI STD-201
Air-Cooled Condensers	All	125°F Condensing Temperature R-22 Test Fluid 190°F Entering Gas Temperature 15°F Subcooling 95°F Entering db	≥176,000 Btu/h·hp	ARI 460

[a] For purposes of this table, *open cooling tower performance* is defined as the maximum flow rating of the tower at the thermal rating condition listed in Table 6.8.1G divided by the fan nameplate rated motor power.
[b] For purposes of this table, *air-cooled condenser performance* is defined as the heat rejected from the refrigerant divided by the fan nameplate rated motor power.
[c] Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
[d] The efficiencies for open cooling towers listed in Table 6.8.1G are not applicable for closed-circuit cooling towers.

Table 23: Proposed Performance Requirements for Heat Rejection Equipment (per open circuit cooling tower addendum to 90.1 – 2004)

Equipment Type ~~d~~	Total System Heat Rejection Capacity at Rated Conditions	Subcategory or Rating Condition	Performance Required[a,b,c]	Test Procedure[~~c~~ d, e]
Propeller or Axial Fan Open Circuit Cooling Towers	All	95°F Entering Water 85°F Leaving Water 75°F ~~wb~~ ~~*Outdoor air*~~ *Entering wb*	≥38.2 gpm/hp	CTI ATC-105 and CTI STD-201
Centrifugal Fan Open Circuit Cooling Towers	All	95°F Entering Water 85°F Leaving Water 75°F ~~wb~~ ~~*Outdoor air*~~ *Entering wb*	≥20.0 gpm/hp	CTI ATC-105 and CTI STD-201
Propeller or Axial Fan Closed Circuit Cooling Towers	All	102°F Entering Water 90°F Leaving Water 75°F *Entering wb*	≥14.0 gpm/hp	CTI ATC-105S and CTI STD-201
Centrifugal Closed Circuit Cooling Towers	All	102°F Entering Water 90°F Leaving Water 75°F *Entering wb*	≥ 7.0 gpm/hp	CTI ATC-105S and CTI STD-201
Air-Cooled Condensers	All	125°F Condensing Temperature R-22 Test Fluid 190°F Entering Gas Temperature 15°F Subcooling 95°F Entering db	≥176,000 Btu/h·hp	ARI 460

[a] For purposes of this table, *open circuit cooling tower performance* is defined as the water flow rating of the tower at the thermal rating condition listed in Table 6.8.1G divided by the fan ~~nameplate~~ ~~rated~~ motor nameplate power.

[b] For purposes of this table, c*losed circuit cooling tower performance* is defined as the process water flow rating of the tower at the thermal rating condition listed in Table 6.8.1G divided by the sum of the fan motor nameplate power and the integral spray pump motor nameplate power.

[~~b~~ c] For purposes of this table, *air-cooled condenser performance* is defined as the heat rejected from the refrigerant divided by the fan ~~nameplate~~ ~~rated~~ motor nameplate power.

[~~c~~ d] Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.

[~~d~~ e] ~~The efficiencies for open cooling towers listed in Table 6.8.1G are not applicable for closed-circuit cooling towers.~~ The efficiencies and test procedures for both open and closed circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of separate wet and dry heat exchange sections.

6. Chillers: Proposed to update the minimum energy efficiency standards for chillers contained in Table 6.8.1 C and introduces, effective January 1, 2010, a new path of compliance for water-cooled chillers. Also the committee recommends that the SSPC re-submits to the IECC the code change proposal amending the minimum efficiency standards for chillers so they become consistent with the efficiencies contained in ASHRAE 90.1 2004. Proposed efficiency requirements for water chilling packages are provided in Table 24.

Table 24: Proposed Efficiency Requirements for Water Chilling Packages

Table 6.8.1C Water Chilling Packages – Efficiency Requirements

Equipment Type	Size Category	Units	Before 1/1/2010		As of 1/1/2010[c]				Test Procedure[b]
					Path A		Path B[d]		
			Full Load	IPLV	Full Load	IPLV	Full Load	IPLV	
Air-Cooled Chillers	<150 tons	EER	≥9.562	≥10.416	≥9.562	≥12.500	NA[e]	NA[e]	ARI 550/590
	≥150 tons	EER			≥9.562	≥12.750	NA[e]	NA[e]	
Air-Cooled without Condenser, Electrical Operated	All Capacities	EER	≥10.586	≥11.782	Air-cooled chillers without condensers must be rated with matching condensers and comply with the air-cooled chiller efficiency requirements				
Water cooled, Electrically Operated, Reciprocating	All Capacities	kW/ton	≤0.837	≤0.696	Reciprocating units must comply with water cooled positive displacement efficiency requirements				
Water Cooled Electrically Operated, Positive Displacement	<75 tons	kW/ton	≤0.790	≤0.676	≤0.780	≤0.630	≤0.800	≤0.600	
	≥75 tons and < 150 tons	kW/ton			≤0.775	≤0.615	≤0.790	≤0.586	
	≥150 tons and < 300 tons	kW/ton	≤0.717	≤0.627	≤0.680	≤0.580	≤0.718	≤0.540	
	≥300 tons	kW/ton	≤0.639	≤0.571	≤0.620	≤0.540	≤0.639	≤0.490	
Water Cooled Electrically Operated, Centrifugal	<150 tons	kW/ton	≤0.703	≤0.669	≤0.634	≤0.596	≤0.639	≤0.450	
	≥150 tons and < 300 tons	kW/ton	≤0.634	≤0.596					
	≥300 tons and < 600 tons	kW/ton	≤0.576	≤0.549	≤0.576	≤0.549	≤0.600	≤0.400	
	≥600 tons	kW/ton			≤0.570	≤0.539	≤0.590	≤0.400	
Air Cooled Absorption Single Effect	All Capacities	COP	≥0.600	NR[f]	≥0.600	NR[f]	NA[e]	NA[e]	ARI 560
Water-Cooled Absorption Single Effect	All Capacities	COP	≥0.700	NR[f]	≥0.700	NR[f]	NA[e]	NA[e]	
Absorption Double Effect Indirect-Fired	All Capacities	COP	≥1.000	≥1.050	≥1.000	≥1.050	NA[e]	NA[e]	
Absorption Double Effect Direct Fired	All Capacities	COP	≥1.000	≥1.000	≥1.000	≥1.000	NA[e]	NA[e]	

a. The chiller equipment requirements do not apply for chillers used in low-temperature applications where the design leaving fluid temperature is <40 F

b. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure
c. Compliance with this standard can be obtained by meeting the minimum requirements of Path A or Path B. However, both the full load and IPLV must be met to fulfill the requirements of Path A or Path B.
d. All Path B chillers must be equipped with demand limiting control capability
e. NA means that this requirement is not applicable and can not be used for compliance
f. NR means that there are no minimum requirements for this category.

7. Transformers. Motion to put transformers back into the Standard 90.1, Chapter 8, Power, Table 8.1. This motion changes and adds language to Chapter 8 to include minimum energy efficiency standards for low voltage dry-type transformers. There are new national standards for low voltage dry-type transformers that went into effect on January 1, 2007, and this table would add a good reference for building owners and code officials. This proposal has been reviewed and approved by the National Electrical Manufacturers Association (NEMA) . The proposed efficiency levels for distribution transformers are presented in Table 25.

Table 25: Proposed Minimum Nomination Efficiency Levels for NEMA Class I Low Voltage Dry-Type Distribution Transformers

Single Phase Transformers		Three Phase Transformers	
kVA[a]	Efficiency (%)[b]	kVA[a]	Efficiency (%)[b]
15	97.7	15	97.0
25	98.0	30	97.5
37.5	98.2	45	97.7
50	98.3	75	98.0
75	98.5	112.5	98.2
100	98.6	150	98.3
167	98.7	225	98.5
250	98.8	300	98.6
333	98.9	500	98.7
		750	98.8
		1000	98.9

8. Lab exhaust fans: This continuous maintenance proposal requires compliance for lab exhaust fans to meet specified maximum bhp limits. This proposal is the second phase to the fan power working group development of the fan power limitations which were developed as part of Addendum AC to 90.1-2004. In that addendum laboratory exhaust fans were excluded. Seven-member working group on laboratories produced Addendum ac. Lab exhaust to be included as a prescriptive requirement, with increased fan pressure for vivariums (2.5" static) and chemical fume hoods. In effect, about 2.5" static is an added allowance for laboratories. (Motion passed 35-0-1). The proposed table is shown as Table 26 in this document. Certain exceptions apply to the limitations, there are listed in Table 27. Laboratory and vivarium base line pressure values are given in Table 28.

Table 26: Proposed changes to Table 6.5.3.1.1A Fan Power Limitations

	Limit	Constant Volume	Variable Volume
Option 1: Fan System Motor Nameplate hp	Allowable Nameplate Motor hp	$hp \leq CFM_S*0.0011$	$hp \leq CFM_S*0.0015$
Option 2: Fan System bhp	Allowable Fan System bhp	$bhp \leq CFM_S * 0.00094 + A$	$bhp \leq CFM_S * 0.0013 + A$

Table 27: Fan Power Limitation Pressure Drop Adjustment

Device	Adjustment
5.2.3.7 Credits	
Fully ducted return and/or exhaust air systems	0.5 in w.c. (2.15 in w.c. for laboratory and vivarium systems)
Return and/or exhaust air flow control devices	0.5 in w.c
Exhaust filters, scrubbers, or other exhaust treatment.	The pressure drop of device calculated at fan system design condition
Particulate Filtration Credit: MERV 9 thru 12	0.5 in w.c.
Particulate Filtration Credit: MERV 13 thru 15	0.9 in w.c.
Particulate Filtration Credit: MERV 16 and greater and electronically enhanced filters	Pressure drop calculated at 2x clean filter pressure drop at fan system design condition.
Carbon and Other gas-phase air cleaners	Clean filter pressure drop at fan system design condition.
Heat Recovery Device, Biosafety Cabinet	Pressure drop of device at fan system design condition.
Evaporative Humidifier/Cooler in series with another cooling coil	Pressure drop of device at fan system design conditions
Sound Attenuation Section	0.15 in w.c.
Exhaust System serving Fume Hoods	0.35 in w.c.
5.2.3.8 Laboratory and Vivarium Exhaust Systems in High Rise Buildings	0.25 in. w.c./100 ft of vertical duct exceeding 75 ft.
~~5.2.3.9 Deductions~~	
~~Fume Hood Exhaust Exception (required if 6.5.3.1.1 Exception (c) is taken)~~	~~-1.0 in w.c.~~

Table 28: Laboratory and Vivarium Base Line Pressure Values

Item	wg
Lab Exhaust Hoods	0.35”
Duct from hood to air control valve	0.15”
Exhaust Air Valve	0.5”
Exhaust Duct from Air Valve to Inlet Manifold	1.5”
Plenum loss factor (expansion, plenum, isolation dpr)	0.5”
Exhaust Stack Discharge	1.0”
Subtotal	4.0”
Existing credit for return system	-1.0”
Existing credit for exhaust airflow control device	-0.5”
Total	2.5”
New Credits	
Fully ducted exhaust systems serving laboratories	2.15”
Exhaust systems serving fume hoods	0.35”

9. Economizers: Efficiency trade off for economizers will need to be changed (at least the Mandatory Minimum EER) to match the new efficiency levels-Addendum g. Also, Phil Rutledge suggestion on Economizers-This idea was approved at the IECC hearings, in principle so work will be required to confirm or refute what was submitted by the proponent. EC 114. “The proposal changes the economizer requirements for the various Zones. Requires economizers in Zones 3A and 4A where they were previously not required and moves Zones 5A and 6A to greater than or equal to 54,000 Btu/h from greater than or equal to 135,000 Btu/h.”
10. Hydronic pump efficiencies:
    Setpoint reset

11. Gas and Oil Fired Boilers, Minimum Efficiency Requirements

The efficiency requirements for commercial boilers in Standard 90.1 have not been changed in a significant way since 90.1-1989. Over the years the number of models available at higher efficiencies has increased. Recently, boiler manufacturers and energy efficiency supporters met and developed a joint proposal to raise the boiler efficiency requirements in 90.1. This addendum involves deleting the current Table 6.2.1F and replacing it with the new table provided. This new table contains three efficiency columns: the current standard, which will continue to apply for several years; a proposed new standard, which will go into effect three years from the date of ASHRAE Board approval; and an additional standard level for one product class, which will go into effect ten years after the previous column. The three-year period before the proposed new standard takes effect is provided to allow manufacturers sufficient time to upgrade models that do not meet the standards. In addition, a new product class is created for gas natural draft steam boilers in order to permit a more gradual transition to the proposed new standard level for this class, since space constraints in old existing boiler rooms provide extra challenges. Available public data indicate that about half the boilers now being sold meet the new proposed requirements. Analysis conducted for the committee indicates that the proposed new efficiency levels will be cost-effective to boiler users using the economic tests generally employed in setting efficiency levels in 90.1. The proposed increases in efficiency will reduce commercial boiler energy use by an average of about 5%. A 5% decrease would save about 18 trillion Btu of gas and oil annually once the existing boiler stock turns over. The proposed requirements are tabulated in Table 29.

Table 29: Proposed Minimum Efficiency Requirements for Gas and Oil Fired Boilers

TABLE 6.8.1F Gas- and Oil-Fired Boilers, Minimum Efficiency Requirements

Equipment Type[a]	Sub-Category or Rating Condition	Size Category (Input)	Minimum Efficiency[b,c]	Efficiency as of 6/29/2009 (Date 3 yrs after ASHRAE Board approval)	Efficiency as of 6/29/2019 (Date 13 yrs after ASHRAE Board approval)	Test Procedure
Boilers, Hot Water	Gas-Fired	≤ 300,000 Btu/h	80% AFUE	80% AFUE	80% AFUE	10 CFR Part 430
		³300,000 Btu/h and £2,500,000 Btu/h[d]	75% E_t	80% E_t	80% E_t	10 CFR Part 431
		> 2,500,000 Btu/h[a]	80% E_c	82% E_c	82% E_c	
	Oil-Fired[e]	£ 300,000 Btu/h	80% AFUE	80% AFUE	80% AFUE	10 CFR Part 430
		³300,000 Btu/h and £ 2,500,000 Btu/h[d]	78% E_t	82% E_t	82% E_t	10 CFR Part 431
		> 2,500,000 Btu/h[a]	83% E_c	84% E_c	84% E_c	
Boilers, Steam	Gas-Fired	≤ 300,000 Btu/h	75% AFUE	75% AFUE	75% AFUE	10 CFR Part 430
	Gas-Fired—All, except natural draft	³300,000 Btu/h and £ 2,500,000 Btu/h[d]	75% E_t	79% E_t	79% E_t	10 CFR Part 431
		> 2,500,000 Btu/h[a]	80% E_c	79% E_t	79% E_t	
	Gas-Fired—Natural Draft	³300,000 Btu/h and £ 2,500,000 Btu/h[d]	75% E_t	77% E_t	79% E_t	
		> 2,500,000 Btu/h[a]	80% E_c	77% E_t	79% E_t	
	Oil-Fired[e]	≤ 300,000 Btu/h	80% AFUE	80% AFUE	80% AFUE	10 CFR Part 430
		³300,000 Btu/h and £ 2,500,000 Btu/h[d]	78% E_t	81% E_t	81% E_t	10 CFR Part 431
		> 2,500,000 Btu/h[a]	83% E_c	81% E_t	81% E_t	

[a] These requirements apply to boilers with rated input of 8,000,000 Btu/h or less that are not packaged boilers and to all packaged boilers. Minimum efficiency requirements for boilers cover all capacities of packaged boilers.
[b] E_c = combustion efficiency (100% less flue losses). See reference document for detailed information.
[c] E_t = thermal efficiency. See reference document for detailed information.
[d] Maximum capacity – minimum and maximum ratings as provided for and allowed by the unit's controls.
[e] Includes oil-fired (residual).

5.2.4 Laboratory's TERP Web Site "eslsb5.tamu.edu".

Since the Fall of 2001, the Laboratory has maintained a TERP webpage (Figure 6, http://esl.eslwin.tamu.edu), where information is provided to builders, code officials, the design community and homeowners about TERP, including:

- The Emissions calculator
    - Opening page: this page directs the visitor to four choices, including:
        - The calculator: This is the emissions calculator that the Laboratory developed for the State of Texas, which contains procedures for calculating NOx, Sox and CO2 emissions calculations from new building models, community projects, and renewables.
        - The kWh-NOx emissions calculator: This is the synchronous NOx emissions calculator for projects where the kWh savings are known for a particular county.
        - The ICCC: This is the entry page for the Laboratory's International Code Compliance Calculator, which was developed at the request of several municipalities for calculating code compliance with the 2000/2001 IECC with SEER 13.
        - The TERP Main page: This is the main page for the TERP project.
- The TERP Main Page
    - Navigation: This page contains general information about the project.
        - Code Compliance Calculator
        - SB5 reportsThis contains the Laboratory's reports to the TCEQ and the Legislature since 2001, as well as conference paper and other presentations about the effort.
        - Testimony: The ESL's Legislative testimony.
        - About: General information about the Laboratory's SB5 responsibilities.
        - More about SB5
        - Role
        - Links
    - Global:
        - Links
        - Search
        - Contact Us
        - Administrator
        - Weather data page: This page is the link to the Laboratory's on-line weather data depository for the hourly/daily weather data gathered as part of the TERP program. This is the main navigation page for find different types of weather data for the 17 sites listed, including:
            - Daily spreadsheet format example
            - Hourly spreadsheet format example
            - Example daily weather data graphs
            - Example hourly weather data graphs
    - Login Form – Where user's can login to the web site.
    - Quick Links
        - Comptroller's energy repot
        - IC3 calculator
        - Legacy eCalc calculator
    - Upcoming conferences
        - ICEBO
    - Past conferences
        - CATEE conference
        - Hot and Humid conference
        - IETC conference

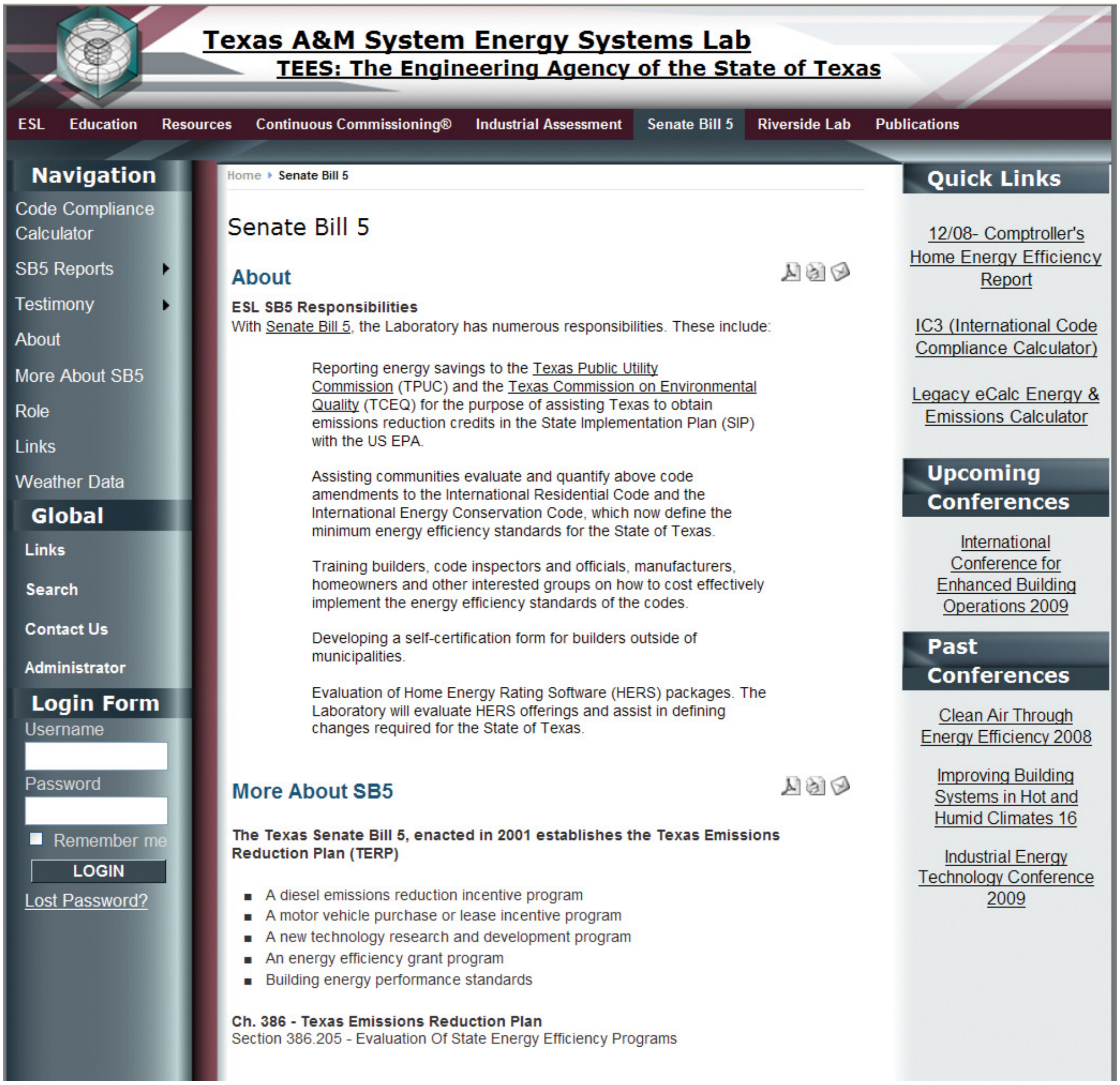


Figure 6: The Laboratory's Senate Bill 5 Web Site (main page).

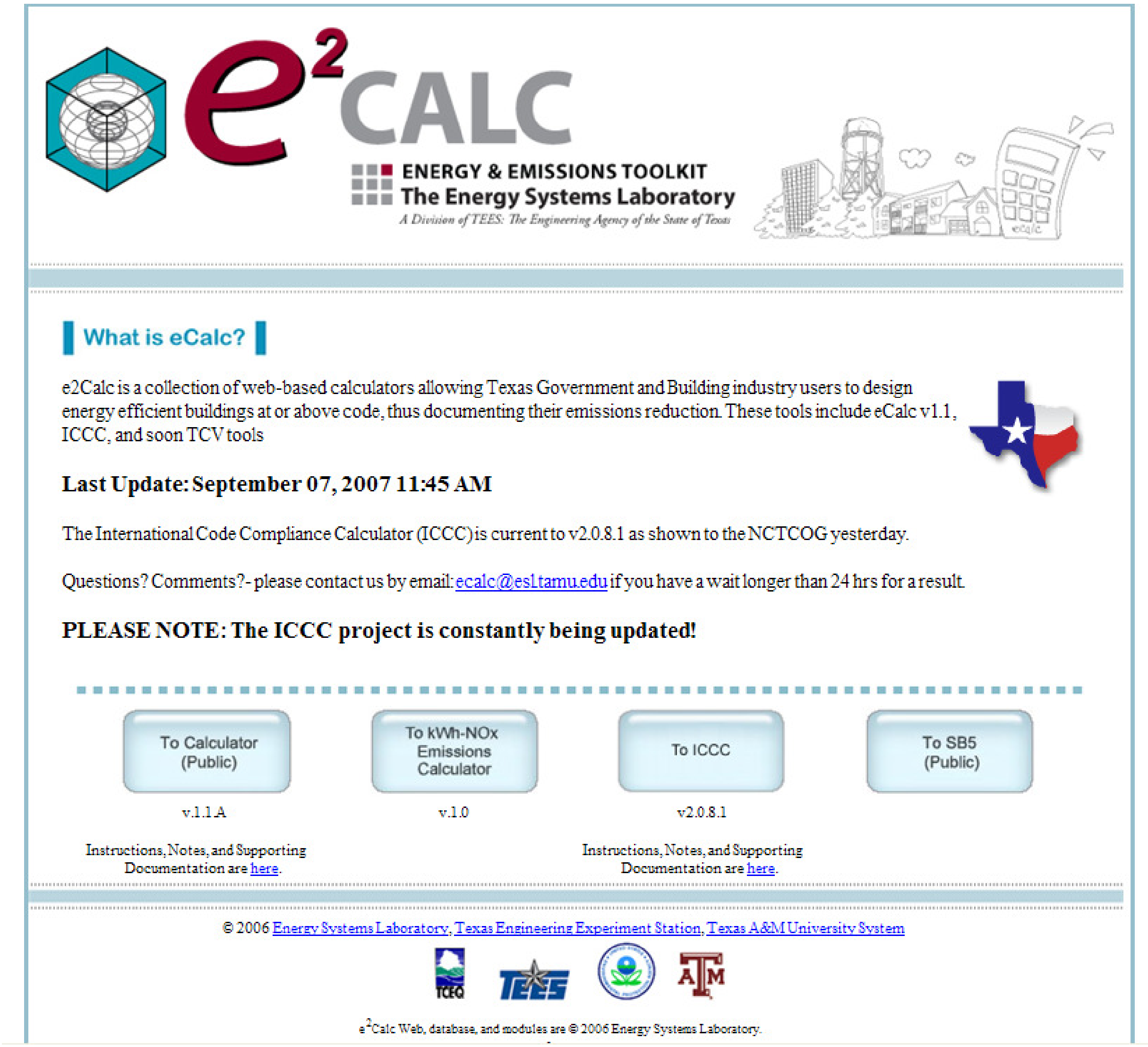


Figure 7: Opening page for the Laboratory's e2CALC Energy and Emissions Toolkit.

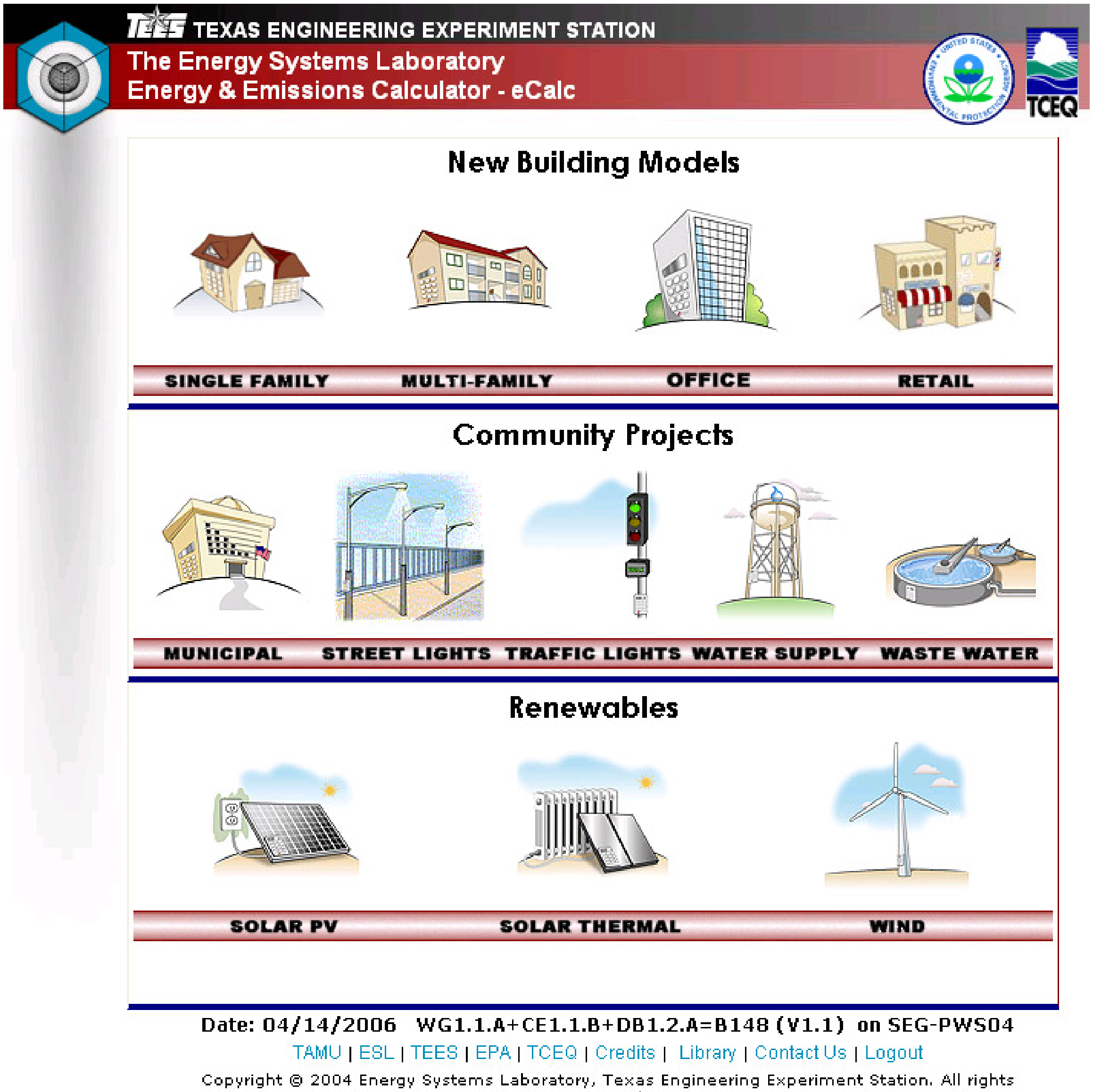


Figure 8: Web Page Providing Access to the Laboratory's eCALC Energy and Emissions Calculator.

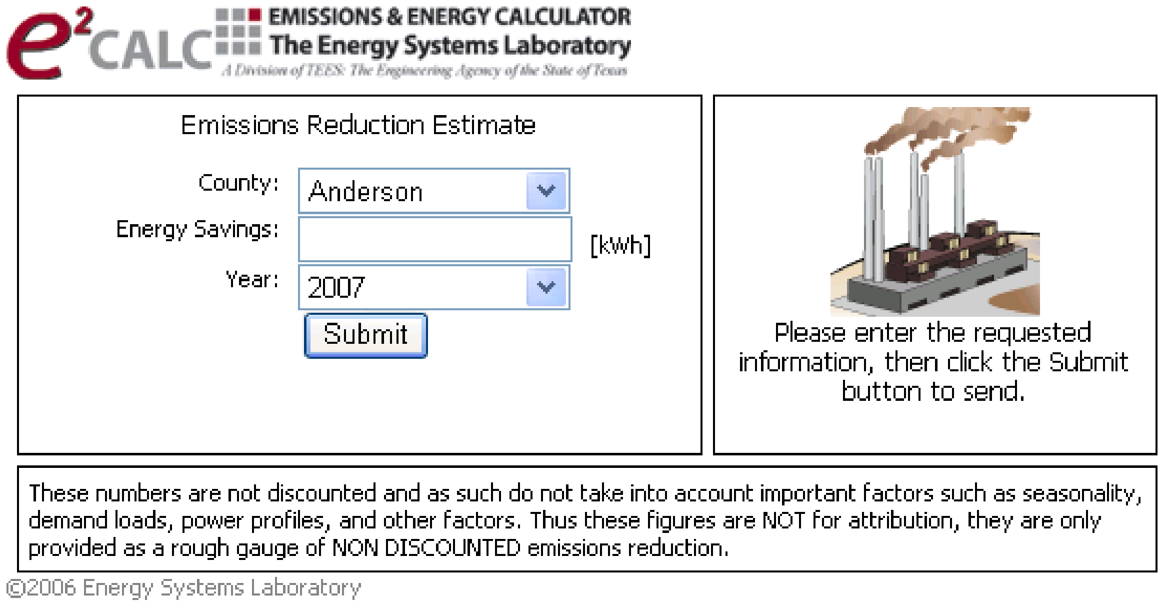


Figure 9: Web Page Providing Access to the Laboratory's Synchronous Emissions Calculator.

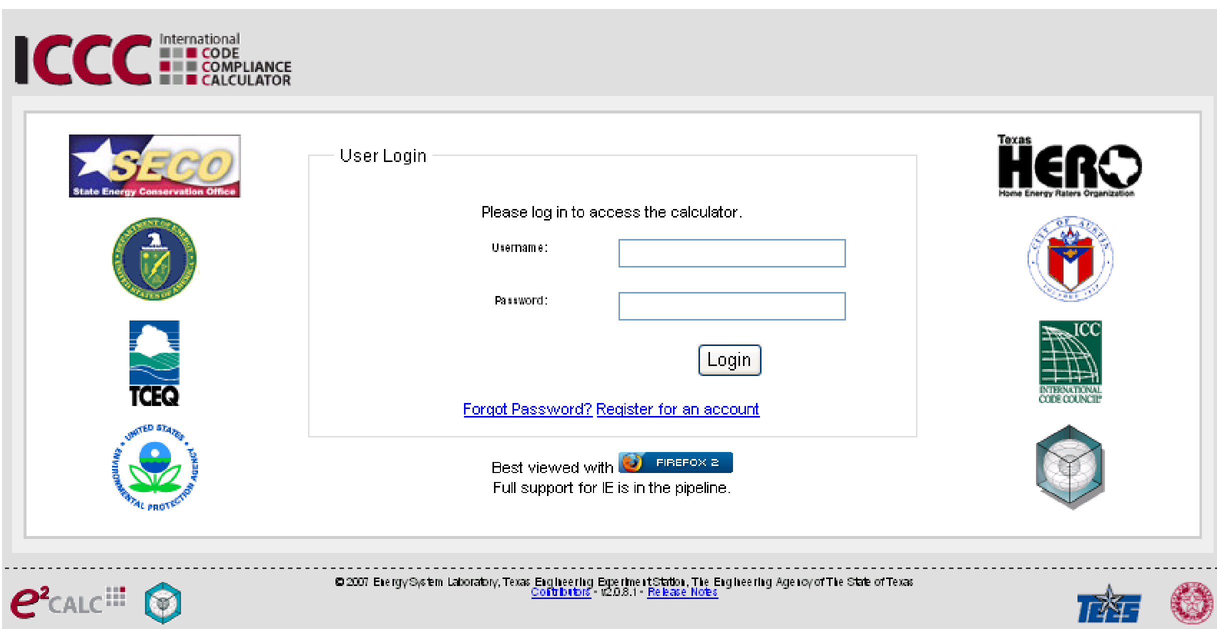


Figure 10: Web Page Providing Access to the Laboratory's International Code Compliance Calculator (ICCC).

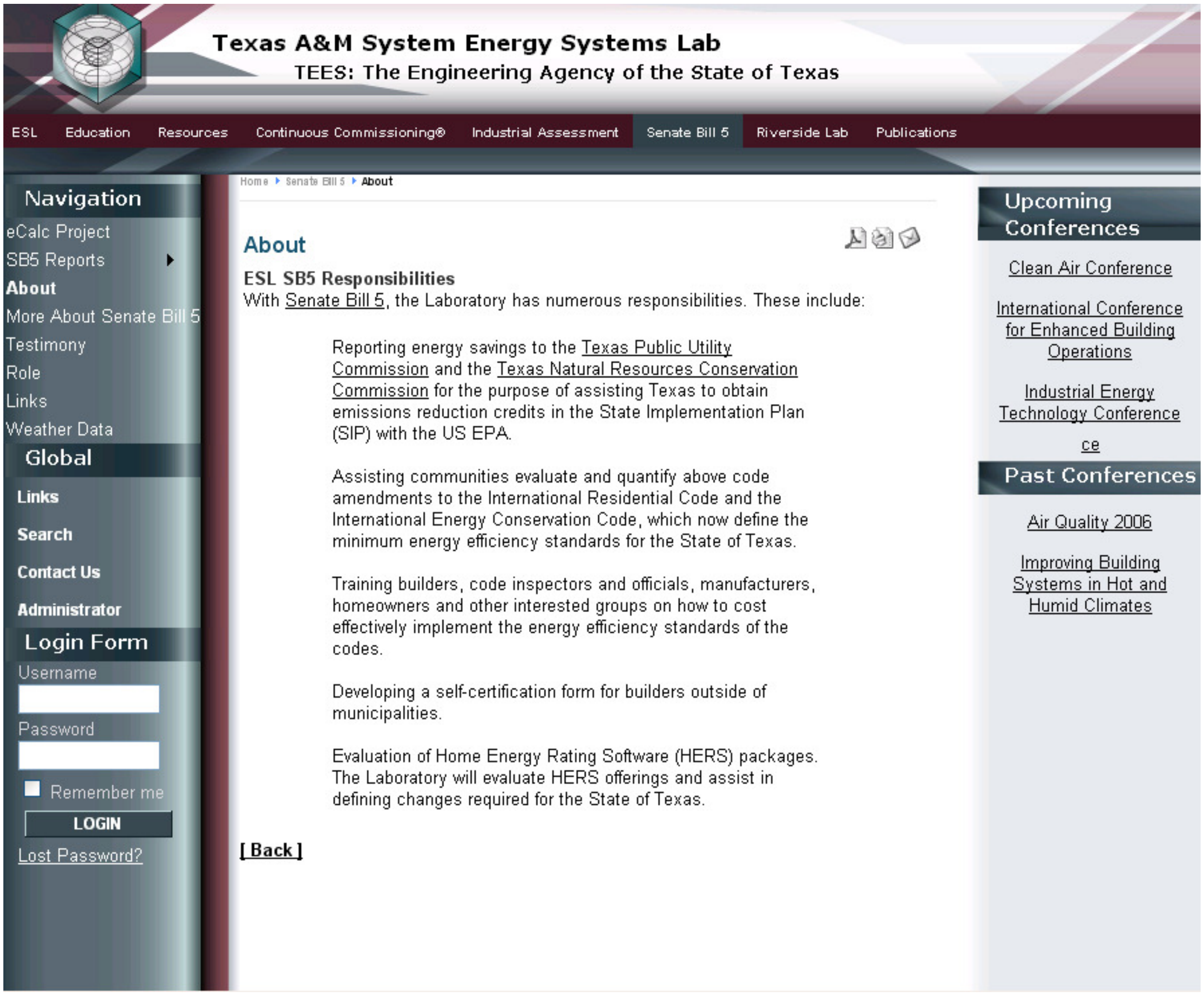
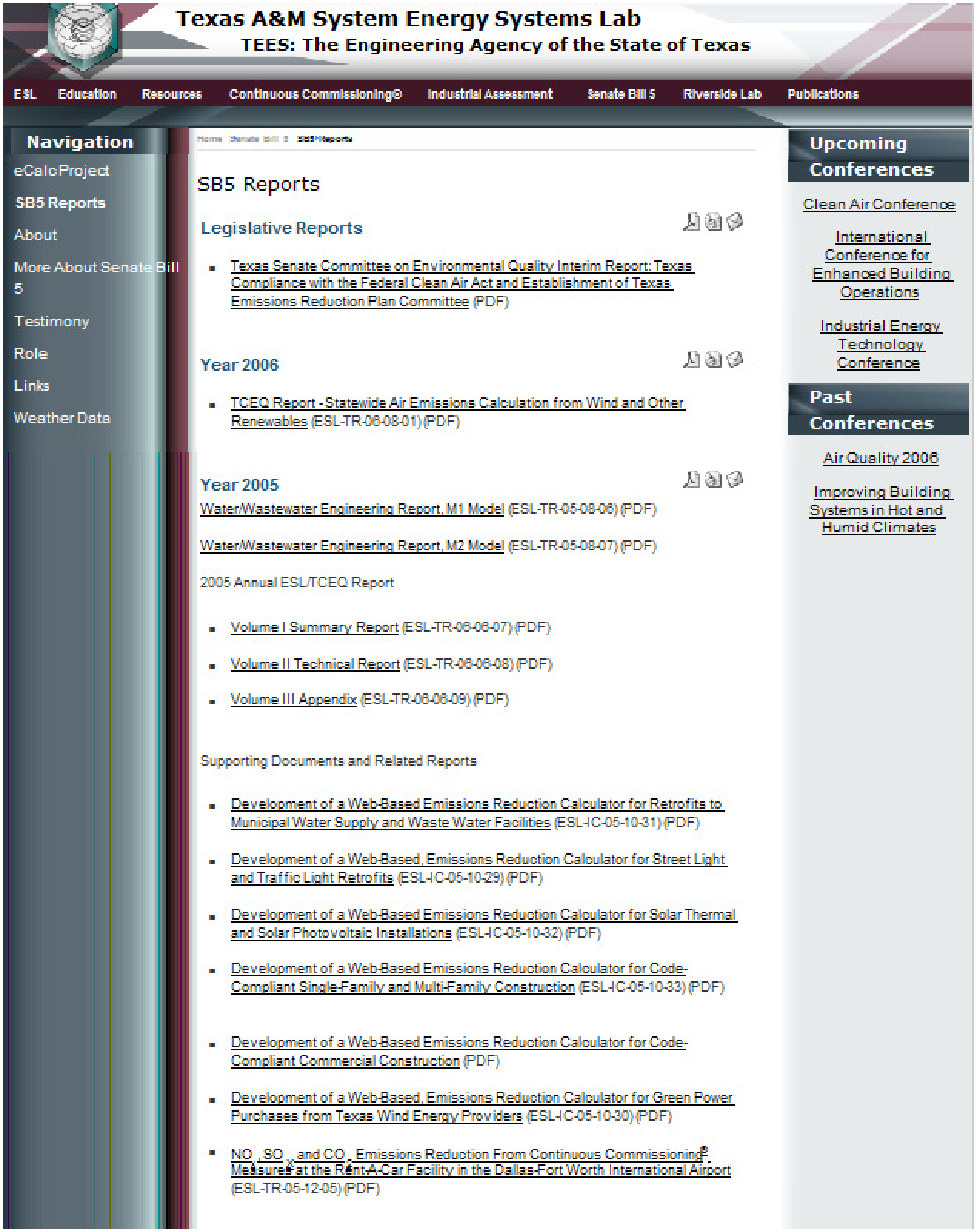


Figure 11: Web Page Providing Information About the Laboratory's Senate Bill Responsibilities.


Texas A&M System Energy Systems Lab
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SB5 Reports

Legislative Reports

- Texas Senate Committee on Environmental Quality Interim Report: Texas Compliance with the Federal Clean Air Act and Establishment of Texas Emissions Reduction Plan Committee (PDF)

Year 2006

- TCEQ Report - Statewide Air Emissions Calculation from Wind and Other Renewables (ESL-TR-06-08-01) (PDF)

Year 2005

Water/Wastewater Engineering Report, M1 Model (ESL-TR-05-08-06) (PDF)

Water/Wastewater Engineering Report, M2 Model (ESL-TR-05-08-07) (PDF)

2005 Annual ESL/TCEQ Report

- Volume I Summary Report (ESL-TR-06-06-07) (PDF)
- Volume II Technical Report (ESL-TR-06-06-08) (PDF)
- Volume III Appendix (ESL-TR-06-06-09) (PDF)

Supporting Documents and Related Reports

- Development of a Web-Based Emissions Reduction Calculator for Retrofits to Municipal Water Supply and Waste Water Facilities (ESL-IC-05-10-31) (PDF)
- Development of a Web-Based, Emissions Reduction Calculator for Street Light and Traffic Light Retrofits (ESL-IC-05-10-29) (PDF)
- Development of a Web-Based Emissions Reduction Calculator for Solar Thermal and Solar Photovoltaic Installations (ESL-IC-05-10-32) (PDF)
- Development of a Web-Based Emissions Reduction Calculator for Code-Compliant Single-Family and Multi-Family Construction (ESL-IC-05-10-33) (PDF)
- Development of a Web-Based Emissions Reduction Calculator for Code-Compliant Commercial Construction (PDF)
- Development of a Web-Based, Emissions Reduction Calculator for Green Power Purchases from Texas Wind Energy Providers (ESL-IC-05-10-30) (PDF)
- NO_x, SO_x and CO_2 Emissions Reduction From Continuous Commissioning® Measures at the Rent-A-Car Facility in the Dallas-Fort Worth International Airport (ESL-TR-05-12-05) (PDF)

Upcoming Conferences

Clean Air Conference

International Conference for Enhanced Building Operations

Industrial Energy Technology Conference

Past Conferences

Air Quality 2006

Improving Building Systems in Hot and Humid Climates

Figure 12: SB5 Public opening page for the Laboratory TERP effort.

Figure 13: Web Page Providing Information About the Laboratory's 2007 Clean Air Through Energy Efficiency (CATEE) Conference.

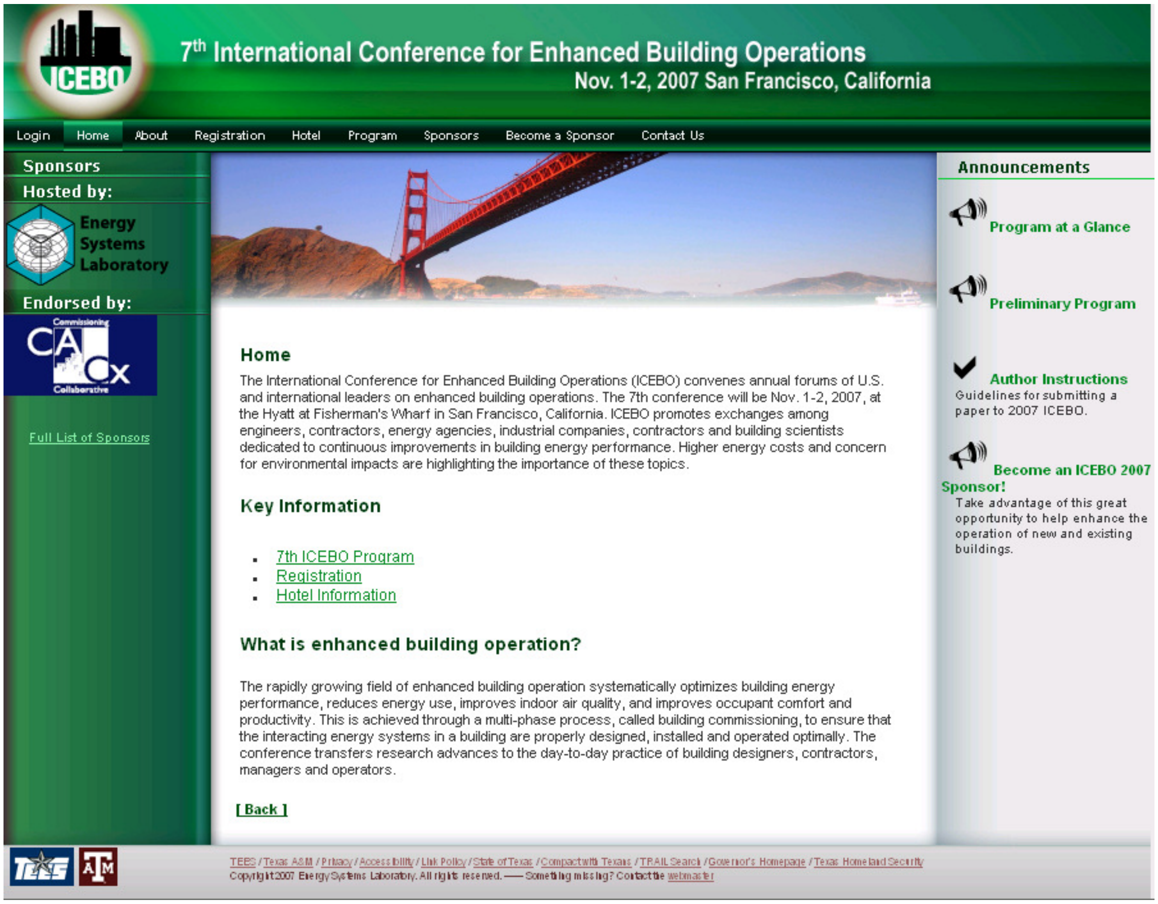


Figure 14: Web Page Providing Information About the Laboratory's 7th Annual International Conference for Enhanced Building Operations (ICEBO) Conference.

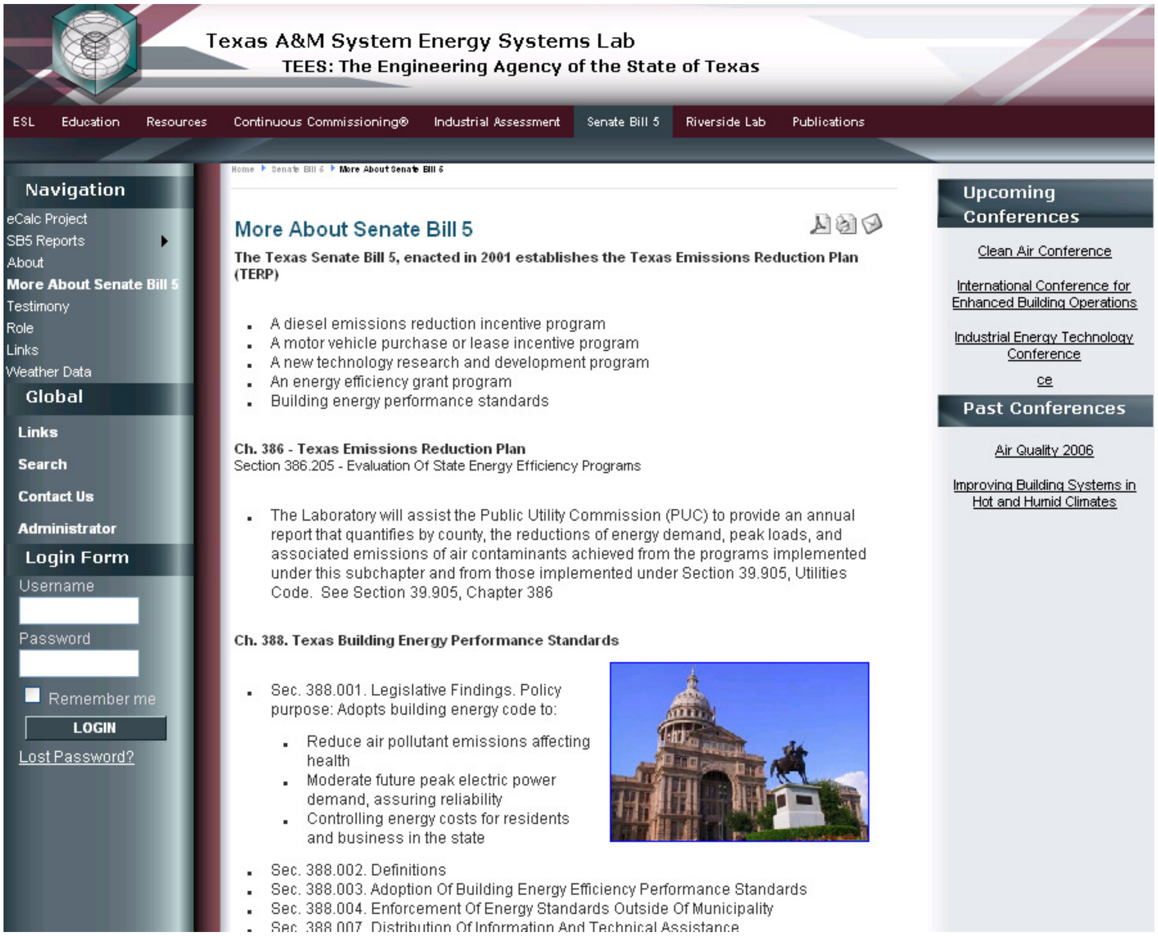
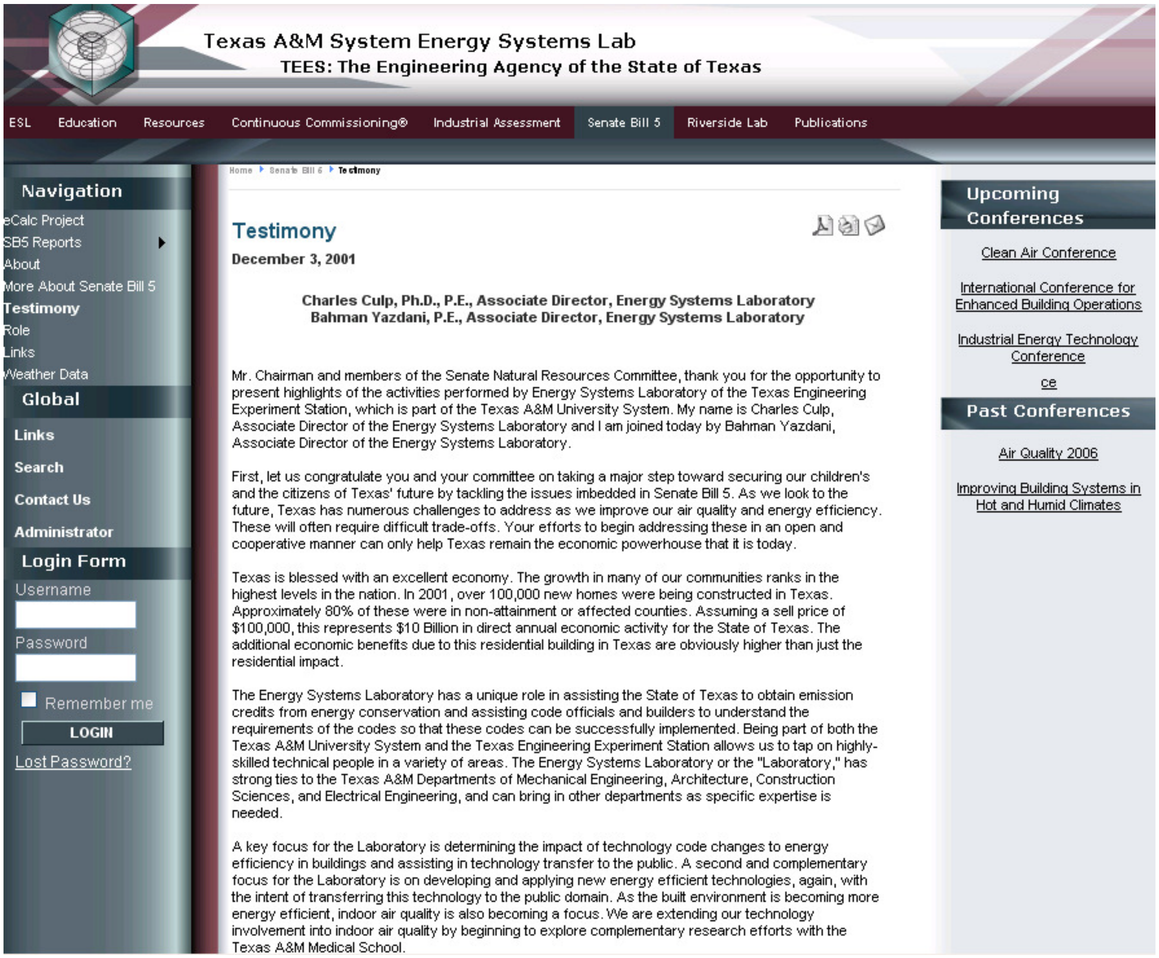


Figure 15: Web Page Providing Additional Information About the Laboratory's TERP Program.



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Testimony

December 3, 2001

Charles Culp, Ph.D., P.E., Associate Director, Energy Systems Laboratory
Bahman Yazdani, P.E., Associate Director, Energy Systems Laboratory

Mr. Chairman and members of the Senate Natural Resources Committee, thank you for the opportunity to present highlights of the activities performed by Energy Systems Laboratory of the Texas Engineering Experiment Station, which is part of the Texas A&M University System. My name is Charles Culp, Associate Director of the Energy Systems Laboratory and I am joined today by Bahman Yazdani, Associate Director of the Energy Systems Laboratory.

First, let us congratulate you and your committee on taking a major step toward securing our children's and the citizens of Texas' future by tackling the issues imbedded in Senate Bill 5. As we look to the future, Texas has numerous challenges to address as we improve our air quality and energy efficiency. These will often require difficult trade-offs. Your efforts to begin addressing these in an open and cooperative manner can only help Texas remain the economic powerhouse that it is today.

Texas is blessed with an excellent economy. The growth in many of our communities ranks in the highest levels in the nation. In 2001, over 100,000 new homes were being constructed in Texas. Approximately 80% of these were in non-attainment or affected counties. Assuming a sell price of $100,000, this represents $10 Billion in direct annual economic activity for the State of Texas. The additional economic benefits due to this residential building in Texas are obviously higher than just the residential impact.

The Energy Systems Laboratory has a unique role in assisting the State of Texas to obtain emission credits from energy conservation and assisting code officials and builders to understand the requirements of the codes so that these codes can be successfully implemented. Being part of both the Texas A&M University System and the Texas Engineering Experiment Station allows us to tap on highly-skilled technical people in a variety of areas. The Energy Systems Laboratory or the "Laboratory," has strong ties to the Texas A&M Departments of Mechanical Engineering, Architecture, Construction Sciences, and Electrical Engineering, and can bring in other departments as specific expertise is needed.

A key focus for the Laboratory is determining the impact of technology code changes to energy efficiency in buildings and assisting in technology transfer to the public. A second and complementary focus for the Laboratory is on developing and applying new energy efficient technologies, again, with the intent of transferring this technology to the public domain. As the built environment is becoming more energy efficient, indoor air quality is also becoming a focus. We are extending our technology involvement into indoor air quality by beginning to explore complementary research efforts with the Texas A&M Medical School.

Upcoming Conferences
Clean Air Conference
International Conference for Enhanced Building Operations
Industrial Energy Technology Conference
ce

Past Conferences
Air Quality 2006
Improving Building Systems in Hot and Humid Climates

Figure 16: Web Page Providing Information About the Laboratory's TERP Testimony to the Senate Natural Resources Committee.

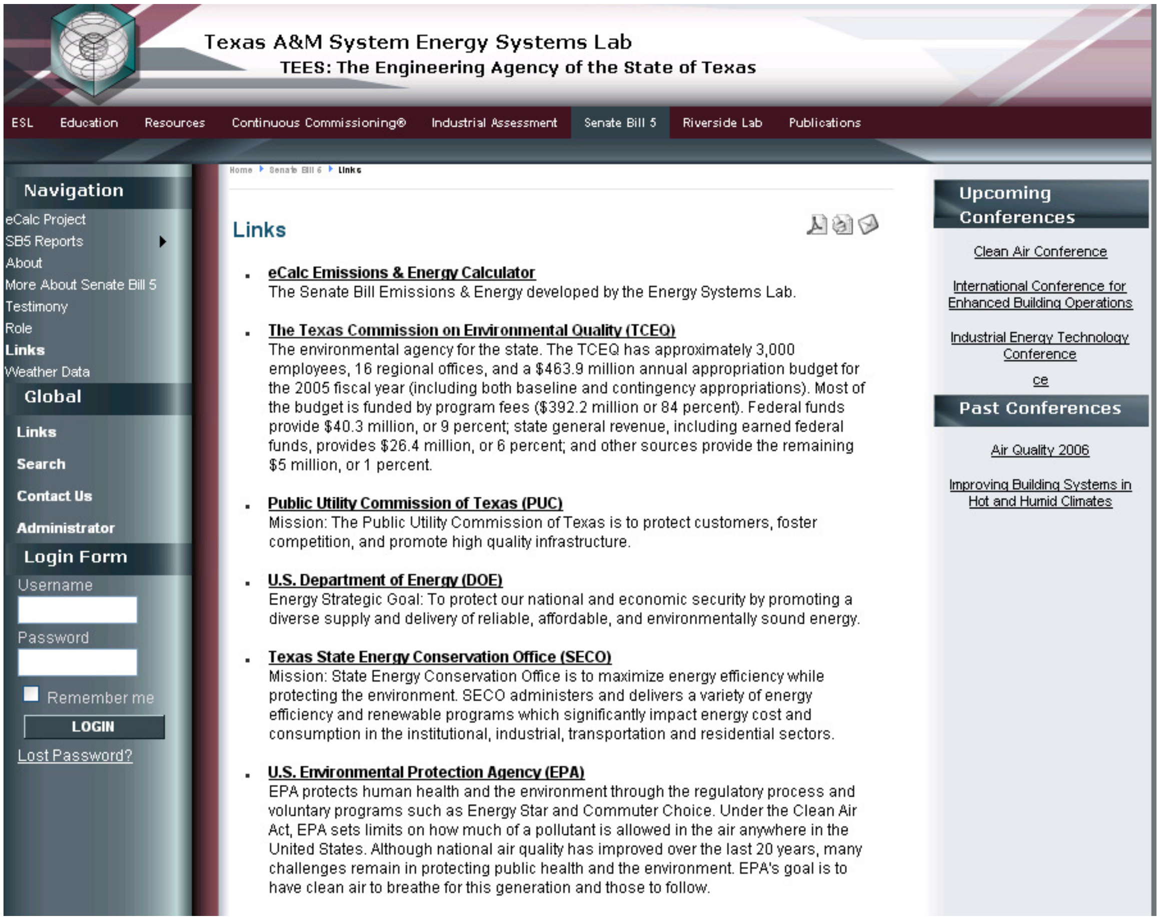


Figure 17: Web Page Providing Information About the Laboratory's Links to Other Government Agencies.

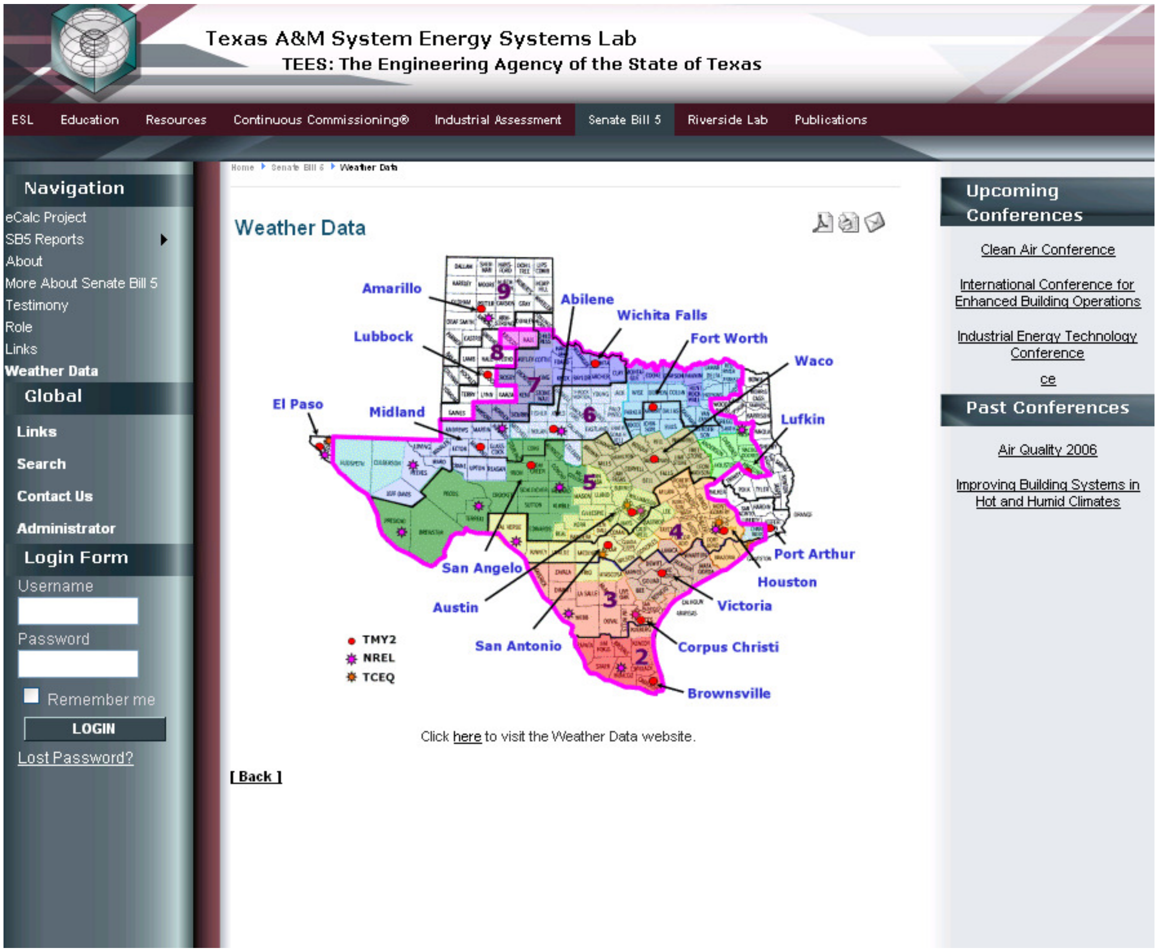


Figure 18: Web Page Providing Information About the Laboratory's TERP Weather Data Collection Effort.

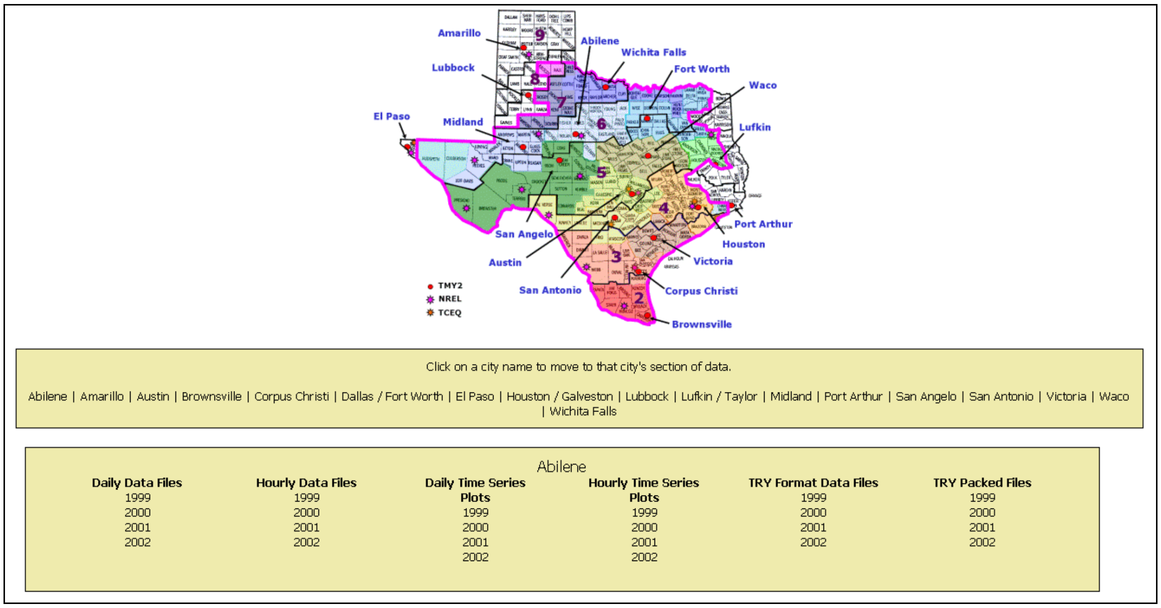


Figure 19: Web Page Providing Site-by-site Weather Data From the Laboratory's TERP Effort.

	A	B	C	D	E	F	G	H	I
1	Date	Average Di	Average W	Average D	Average W	Total Glob	Total Norm	Total Precipitation (in)	
2	1/1/1999	55.8	49.8	44.4	14.8	505.4	62.1	0	
3	1/2/1999	35.3	29.3	18	14.1	986.1	1428.1	0	
4	1/3/1999	26.4	20.6	4.6	10.6	1022.2	1509.9	0	
5	1/4/1999	29.8	23.3	8.7	7.7	1179.2	2503.3	0	
6	1/5/1999	45.8	34.9	17.5	14.4	1185.2	2581.3	0	
7	1/6/1999	45.5	36.3	23.3	5	1179.5	2591.4	0	
8	1/7/1999	44.3	40.6	36.3	5.2	1181.4	2548.9	0	
9	1/8/1999	32.1	30.8	28.4	11.3	266.7	2.5	0	
10	1/9/1999	27.8	23.4	14.3	8.4	1203.3	2522.6	0	
11	1/10/1999	42.8	33.9	19.9	8.7	1197.9	2534	0	
12	1/11/1999	48.5	39.9	29.4	14.2	1191.9	2391	0	
13	1/12/1999	58.9	48.5	37.8	12.8	827.5	665.2	0	
14	1/13/1999	39.5	35.2	29.1	8	845	952.8	0	
15	1/14/1999	35.4	30.3	21.9	7.4	1225.2	2519.7	0	
16	1/15/1999	52.1	40	24.3	14.3	1263.5	2728.7	0	
17	1/16/1999	52.5	41.3	26.6	9.3	1232.4	2434.8	0	
18	1/17/1999	59.5	43.6	23	10.6	1225.5	2434.4	0	
19	1/18/1999	50.2	39	22.7	6.3	1222.9	2420.8	0	
20	1/19/1999	63.4	47.6	30.5	11.2	1239.1	2334.6	0	
21	1/20/1999	62.8	49.4	35.5	8.1	1123.7	1800.9	0	
22	1/21/1999	61.1	48.4	35	12.6	924.3	1174.1	0	
23	1/22/1999	42.3	38.2	32.3	13	153.1	3.8	0.1	
24	1/23/1999	45.8	38.9	30.3	7.2	1352	2865.3	0	
25	1/24/1999	60.3	45.3	27.8	9.2	1227.7	2216.6	0	
26	1/25/1999	48.1	41.2	32.9	6.2	1350.4	2326.6	0	
27	1/26/1999	60.3	51	42.5	16.9	1256.9	2140.8	0	
28	1/27/1999	59.9	53.9	49	10.5	817.7	650.3	0	
29	1/28/1999	54.1	50.9	48.3	10.8	587.5	162	0	
30	1/29/1999	37	36.9	36	10.2	116	0.6	1.8	
31	1/30/1999	40.2	37.6	34.4	11.8	595.1	236.2	0	

Figure 20: Spreadsheet Showing Daily Weather Data for Abiline, 1999.

	A	B	C	D	E	F	G	H
1	Date time	Dry-Bulb T	Wet-Bulb T	Dew-Point	Wind Spee	Global Sol	Normal Dre	Precipitatio
2	1/1/1999 0:00	47	43	39	9	0	0	0
3	1/1/1999 1:00	47	45	43	16	0	0	0
4	1/1/1999 2:00	48	47	46	11	0	0	0
5	1/1/1999 3:00	49	48	48	14	0	0	0
6	1/1/1999 4:00	49	48	48	9	0	0	0
7	1/1/1999 5:00	49	48	48	11	0	0	0
8	1/1/1999 6:00	51	50	50	11	0	0	0
9	1/1/1999 7:00	54	53	52	15	0	0	0
10	1/1/1999 8:00	56	54	53	15	0.3	0	0
11	1/1/1999 9:00	60	56	53	15	13	1.3	0
12	1/1/1999 10:00	61	57	54	14	69.4	42.8	0
13	1/1/1999 11:00	62	57	54	19	53	0.6	0
14	1/1/1999 12:00	68	59	52	22	57.7	1.3	0
15	1/1/1999 13:00	68	58	50	19	95.4	7	0
16	1/1/1999 14:00	71	58	48	16	84.3	1.9	0
17	1/1/1999 15:00	71	56	44	7	73.2	0.6	0
18	1/1/1999 16:00	69	51	32	5	35.2	0.3	0
19	1/1/1999 17:00	64	49	33	6	20.6	6	0
20	1/1/1999 18:00	67	48	26	14	3.2	0.3	0
21	1/1/1999 19:00	56	50	44	25	0	0	0
22	1/1/1999 20:00	49	45	41	16	0	0	0
23	1/1/1999 21:00	45	43	41	23	0	0	0
24	1/1/1999 22:00	40	38	35	21	0	0	0
25	1/1/1999 23:00	38	35	31	23	0	0	0
26	1/2/1999 0:00	37	34	30	15	0	0	0
27	1/2/1999 1:00	35	32	27	22	0	0	0
28	1/2/1999 2:00	34	31	26	22	0	0	0
29	1/2/1999 3:00	33	30	24	26	0	0	0
30	1/2/1999 4:00	31	28	22	25	0	0	0
31	1/2/1999 5:00	30	27	21	22	0	0	0
32	1/2/1999 6:00	30	27	21	23	0	0	0
33	1/2/1999 7:00	29	26	21	16	0	0	0
34	1/2/1999 8:00	32	28	20	14	1.6	5.7	0
35	1/2/1999 9:00	33	28	18	16	38	176.9	0
36	1/2/1999 10:00	37	30	18	17	81.8	165.8	0
37	1/2/1999 11:00	39	31	17	19	140.5	282.8	0
38	1/2/1999 12:00	42	33	16	16	176.3	296.8	0
39	1/2/1999 13:00	43	33	17	16	179.8	257.1	0

Figure 21: Spreadsheet Showing Hourly Weather Data for Abiline, 1999.

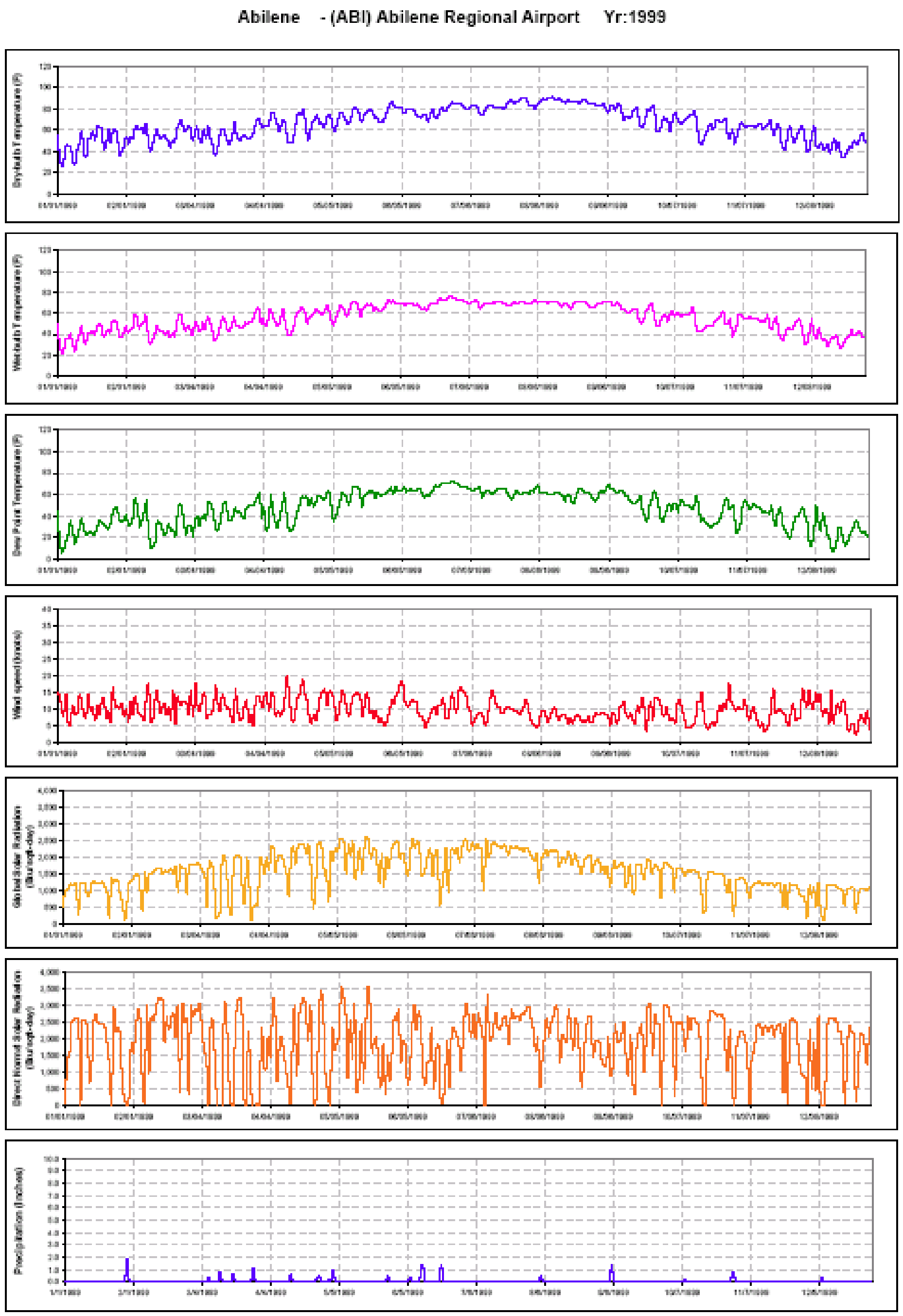


Figure 22: Time Series Graphs Showing Daily Weather Data for Abiline, 1999.

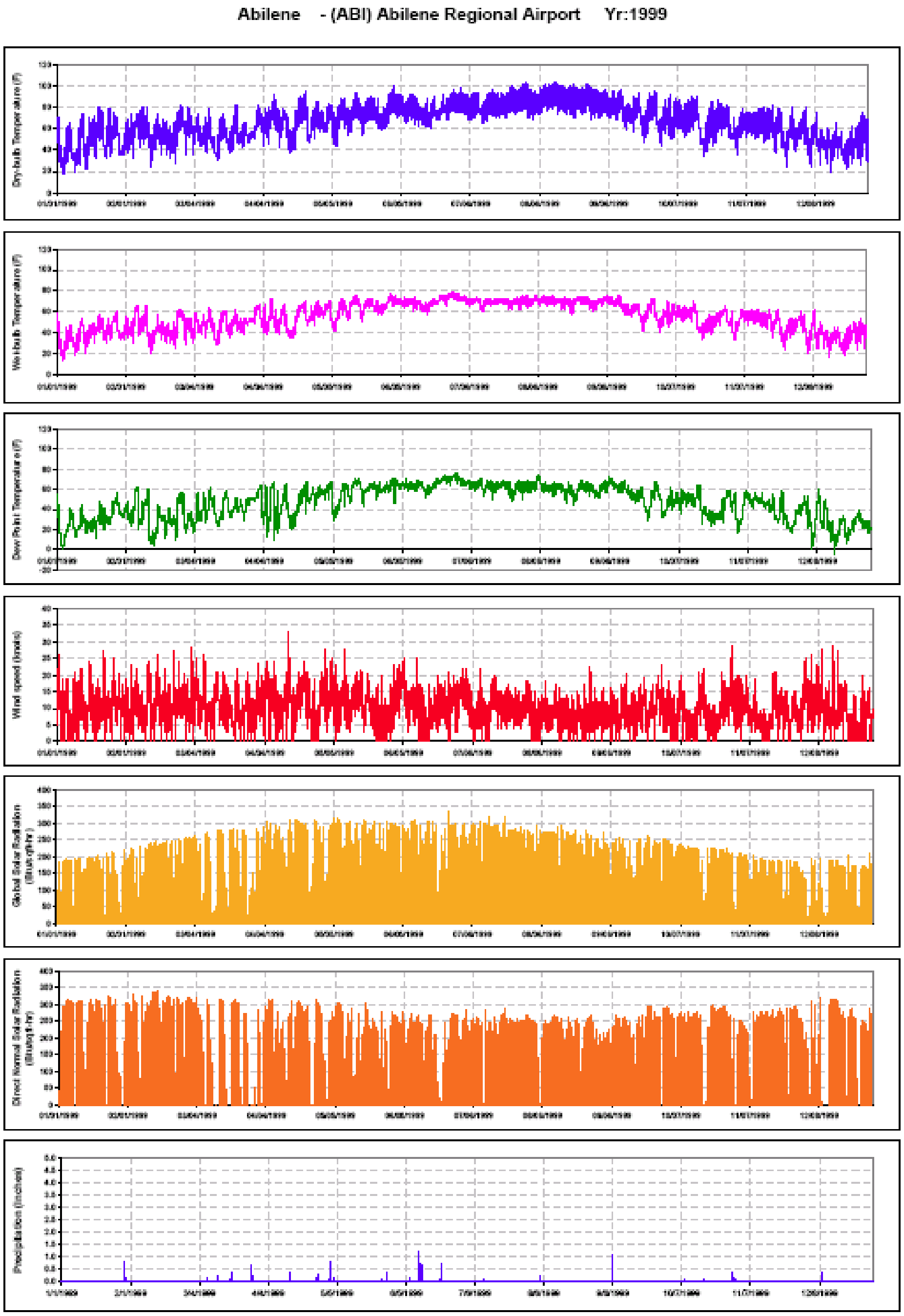


Figure 23: Time Series Graphs Showing Hourly Weather Data for Abiline, 1999.

5.2.5 Provide Technical Assistance to the TCEQ.

The Laboratory received dozons of calls per week from code officials, builders, home owners and municipal officials regarding the building code and emissions calculations. A complete file of these transactions is maintained at the Laboratory. Specific Technical Assistance responses are contained in the related sections of this report.

5.2.6 Delivered "Statewide Air Emissions Calculations from Wind and Other Renewables: Summary Report Sept.2006 – Aug 2007", to the Texas Commission on Environmental Quality in August 2007.

The Energy Systems Laboratory, in fulfillment of its responsibilities under this Legislation, submits its second annual report, "Statewide Air Emissions Calculations from Wind and Other Renewables," to the Texas Commission on Environmental Quality.

The report is organized in several deliverables:

- A Summary Report, which details the key areas of work;
- Supporting Documentation;
- Supporting data files, including weather data, and wind production data, which have been assembled as part of the first year's effort.

This executive summary provides summaries of the key areas of accomplishment this year, including:

- continuation of stakeholder's meetings;
- review of electricity savings reported by ERCOT;
- analysis of wind farms using 2005 data;
- preliminary reporting of NOx emissions savings in the 2006 Integrated Savings report to TCEQ;
- prediction of on-site wind speeds using Artificial Neural Networks (ANN);
- improvements to the daily modeling using ANN-derived wind speeds;
- development of a degradation analysis;
- development of a curtailment analysis;
- analysis of other renewables, including: PV, solar thermal, hydroelectric, geothermal and landfill gas;
- estimation of hourly solar radiation from limited data sets;

5.2.6.1 Development of Stakeholder's meetings.

Legislation passed during the regular session of the 79th Legislature directed the Energy Systems Laboratory to work with the TCEQ to develop a methodology for computing emissions reductions attributable to renewable energy and for the Laboratory to quantify the emissions reductions attributable to renewables for inclusion in the State Implementation Plan annually. HB 2921 directed the Texas Environmental Research Consortium (TERC) to engage the Texas Engineering Experiment Station for the development of this methodology.

During the 2006-2007 period Texas A&M held continuing Stakeholder's meetings. A presentation of the overheads used in these meetings is contained in this report.

5.2.6.2 Review of Electricity Savings Reported by ERCOT

In this report, the information posted on ERCOT's Renewable Energy Credit Program site www.texasrenewables.com is reviewed. In particular, information posted under the "Public Reports" tab was downloaded and assembled into an appropriate format for review. This includes ERCOT's 2001 through 2006 reports to the Legislature, and information from ERCOT's listing of REC generators.

5.2.6.3 Analysis of wind farms using 2005 data.

In this report the weather normalization procedures developed together with the Stakeholders[17] were applied to several additional wind farms that reported their data to ERCOT during the 2005 measurement period, together with wind data from the nearby NOAA weather stations. In the 2006 Wind and Renewables report to the TCEQ (Haberl et al. 2006) weather normalization analysis methods were reviewed, and an analysis was shown for a single wind turbine in Randall, Texas, as well as an analysis of a wind farm containing multiple turbines at the Indian Mesa facility in Pecos, Texas.

In this report, an analysis of wind data for the Sweetwater I wind farm in Nolan County, Texas is provided, including the processing of weather and power generation data, modeling of daily power generation versus daily wind speed using the ASHRAE Inverse Model Toolkit (IMT) (Haberl et al. 2003; Kissock et al. 2003), prediction of 1999 wind power generation using developed coefficients from the 2005 daily model, and the analysis on monthly capacity factors generated using the model.

Finally, a summary of total predicted wind power production in the base year (1999) for all the wind farms in the ERCOT region using the developed procedure is presented to show the improved accuracy of using this weather normalization procedure compared to the non-weather normalization procedure reported in the 2006 integrated savings report to the TCEQ (Haberl et al. 2006). This includes an uncertainty analysis that was performed on all the daily regression models and included in this report to show the accuracy of applying the linear regression models to predict the wind power generation that the wind farms would have had in the base year of 1999. The detailed analysis for each wind farm is provided in the Appendix to this report. The original data used in the analysis is included in the accompanying CD-ROM with this report.

5.2.6.4 Preliminary reporting of NOx emissions savings in the 2006 Integrated Savings report to TCEQ;

In this report, the preliminary 2006 cumulative NOx emissions savings are reported. These values represent the electricity and NOx emissions savings that are reported to the TCEQ through the integrated NOx emissions savings reporting procedures, which contain growth, discount, and degradation factors.

5.2.6.5 Prediction of on-site wind speeds using Artificial Neural Networks (ANN).

Electricity produced by wind farms in Texas reduces the emission of air pollutants which would otherwise have been produced by burning fossil fuels to generate the same electricity. As more wind farms are commissioned (and some turbines decommissioned), proper accounting of pollution credits for wind energy requires normalization of the generation to a standard year, because year-to-year variations from the long term mean are significant.

In this report, we first discuss extrapolation to a reference year using an advanced Artificial Neural Network (ANN) model. Such a model is needed since we cannot expect to have wind data at the site of the turbine/farm for the reference year. The main question is: is it possible to use available hourly NOAA data, hourly site wind data, and hourly power generation data for a period of a few months bracketing the ozone season for any given year to develop an hourly model relating power generation to site wind, and site wind to NOAA data? If so we can extrapolate the hourly wind farm performance to the ozone season of the reference year. A secondary question addressed is how to account for non-utilization of available wind power due to transmission constraints. Actually, two data sets are analyzed: one for a single wind turbine in Randall county, and a second set for the Indian Mesa I wind farm in Pecos county.

5.2.6.6 Improvements to the daily modeling using ANN-derived wind speeds.

In this report, the ANN model is shown to substantially improve the on-site wind data predictions using NOAA data as a measure of the site wind. In the analysis, the Indian Mesa wind farm was used again as an example to show that using ANN-derived, on-site wind speed in the daily regression model can provide more accurate prediction on monthly and Ozone Season Periods (OSP) power generation. If this procedure could be used across all the wind farms in the ERCOT region, it is felt that substantial improvements could be made to reduce the uncertainty of the predictions of the power produced in the base year, and therefore reductions in NOx emissions from electricity derived from wind energy. In the report, the procedure was developed to compare the ANN daily model using ANN-derived on-site wind and the NOAA daily model.

[17] See the previous section that describes the conference calls held with the Wind Energy Stakeholder's group to develop the methodologies.

5.2.6.7 Development of a degradation analysis.

This report contains an analysis to determine what amounts of degradation could be observed in the measured power from Texas wind farms. Currently, the TCEQ uses a very conservative 5% degradation per year for the power output from a wind farm when making future projections from existing wind farms. Accordingly, the TCEQ asked the Laboratory to evaluate any observed degradation from the measured data for Texas wind farms. To accomplish this, nine wind farms (14 sites) in Texas from 2002 to 2005 were evaluated. These wind farms were built before Jan 2002, with a total capacity of 1,010 MW.

In this analysis, a sliding statistical index was established for each site that uses 10th, 25th, 50th, 75th, 90th, 99th percentiles of the hourly power generation over a 12-month sliding period[18], as well as mean, minimum and maximum hourly power generation of the same 12-month period. These indices are then displayed using one data symbol for each 12-month slide, beginning from the first 12-month period (i.e., January 2002 to December 2002) until the last 12-month period (January 2005 to December 2005) for each of the wind farms.

5.2.6.8 Development of a curtailment analysis.

During the analysis of the measured power production from the Indian Mesa wind farm and the subsequent discussions with the wind stakeholders, group, including representatives from ERCOT, it became clear that the dataset contained substantial amounts of data that represented periods when the wind farm owners were instructed to curtail their power production because of constraints on the electric transmission lines. Unfortunately, it was determined that there was no electronic record of the amount of curtailment for this site[19]. As the analysis progressed, it became clear that an hourly analysis that used a manufacturer's wind power curve, multiplied by the prevailing on-site wind speed, and scaled for the number of turbines at the site presented the possibility of empirically determining the curtailment for the site. Therefore, the TCEQ requested that the Laboratory perform a proof-of-concept analysis to empirically determine the curtailment at the Indian Mesa site.

In this report, the measured power production for the period July 2002 to January 2003 from the Indian Mesa wind farm was analyzed using the on-site wind speed and manufacturer's power curves. Significant curtailment was observed during this period due to the power constraints in the McCamey power transmission area.

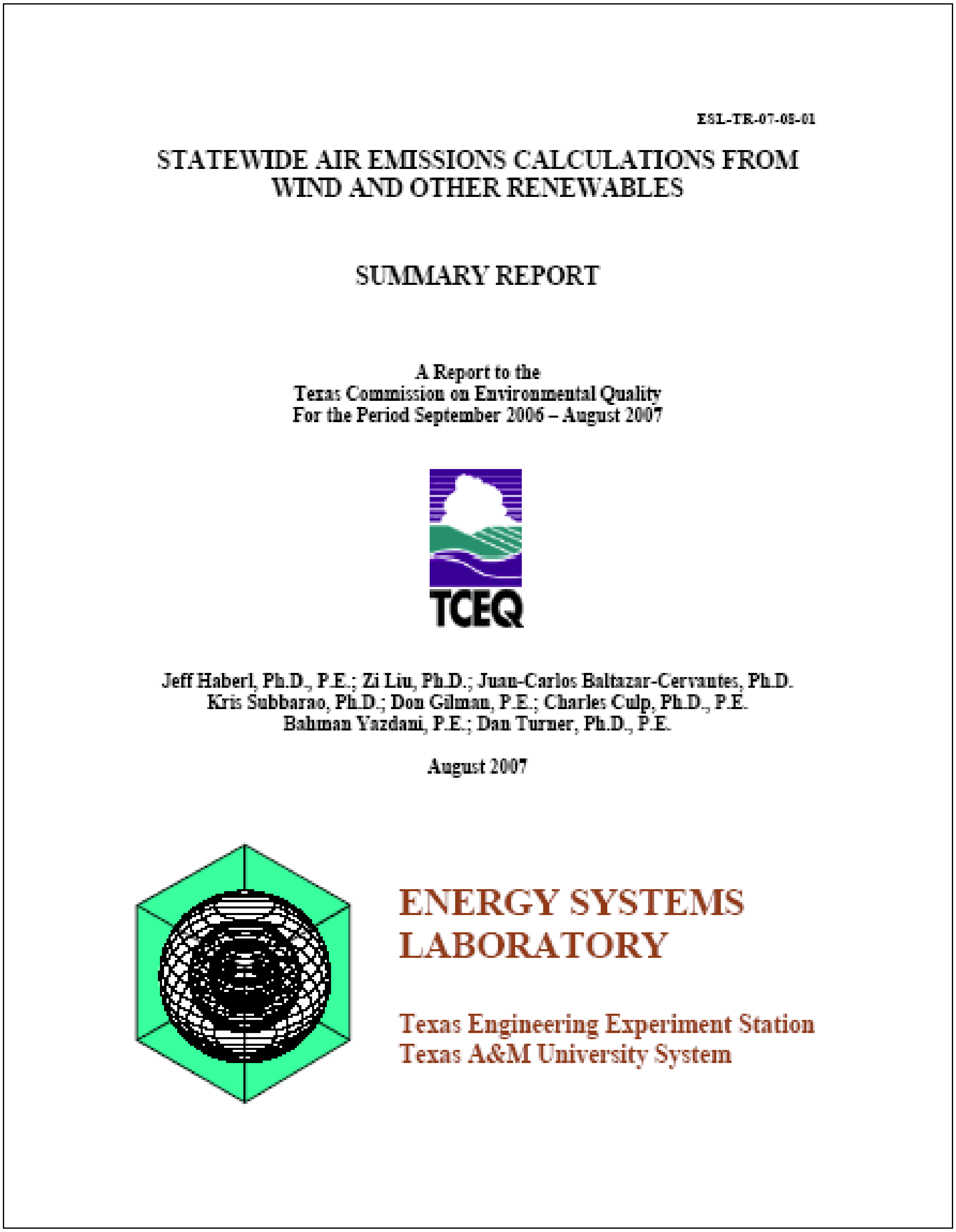
5.2.6.9 Analysis of other renewables.

In this report, other renewable energy projects throughout the state of Texas were located to determine the NOx emissions reduction. Searches were conducted on four specific categories: solar photovoltaic, geothermal, hydroelectric, and Landfill Gas-fired Power Plants, and information assembled for inclusion in this report.

5.2.6.10 Estimation of hourly solar radiation from limited data sets.

One of the important tasks performed as part of the Laboratory's Senate Bill 5 effort has been the assembly and use of measured weather data for all Texas NOAA sites that correspond to the TMY2 sites for the years 1999 to 2006. Unfortunately, many of these sites have had discontinuous solar data, which requires the use of synthetic solar radiation to fill-in missing records. Therefore, this report contains information about the synthesis procedures used to generate the solar radiation data for those sites where data are missing.

[18] To calculate this hourly data, the 12-month period is converted into quartiles, and those quartiles are recorded in a table. Then, the oldest month is dropped from the dataset and a new month is added, and the quartiles recalculated and recorded, etc.
[19] This would appear to be true for other sites in ERCOT.



ESL-TR-07-08-01

STATEWIDE AIR EMISSIONS CALCULATIONS FROM
WIND AND OTHER RENEWABLES

SUMMARY REPORT

A Report to the
Texas Commission on Environmental Quality
For the Period September 2006 – August 2007

TCEQ

Jeff Haberl, Ph.D., P.E.; Zi Liu, Ph.D.; Juan-Carlos Baltazar-Cervantes, Ph.D.
Kris Subbarao, Ph.D.; Don Gilman, P.E.; Charles Culp, Ph.D., P.E.
Bahman Yazdani, P.E.; Dan Turner, Ph.D., P.E.

August 2007

ENERGY SYSTEMS
LABORATORY

Texas Engineering Experiment Station
Texas A&M University System

Figure 24: Cover page of "Statewide Air Emissions Calculations From Wind and Other Renewables", August 2007.

5.2.7 Technical Assistance

The Laboratory provided technical assistance to the TCEQ, the PUC, SECO and ERCOT, as well as Stakeholders participating in a number of conferences and presentations. In 2007 the Laboratory continued to work closely with the TCEQ to develop an integrated emissions calculation, that provided the TCEQ with a creditable NOx emissions reduction from energy efficiency and renewable energy (EE/RE) programs reported to the TCEQ in 2005, 2006 and 2007 by the Laboratory, PUC, SECO, and Wind-ERCOT.

The Laboratory has also enhanced the previously developed emissions calculator by: expanding the capabilities to include all counties in ERCOT; including the collection and assembly of weather from 1999 to the present from 17 NOAA weather stations; and enhancing the underlying computer platform for the calculator.

The Laboratory has and will continue to provide leading edge technical assistance to counties and communities working toward obtaining full SIP credit for the energy efficiency and renewable energy projects that are lowering the emissions and improving the air for all Texans. The Laboratory will continue to provide superior technology to the State of Texas through efforts with the TCEQ and US EPA. The efforts taken by the Laboratory have produced significant success in bringing EE/RE closer to US EPA acceptance in the SIP.

5.2.7.1 Presentation at the American Waste Management Association Meeting, Austin, (February 2007).

In February 2007, the Laboratory was asked to give a talk to the Austin Chapter of the Amercian Waste Managemetn Association. The presentation that was delivered discussed the Laboratory's efforts to develop creditable emissions calculations for electricity generated from wind farms. The following figures present the slides used in the presentation.

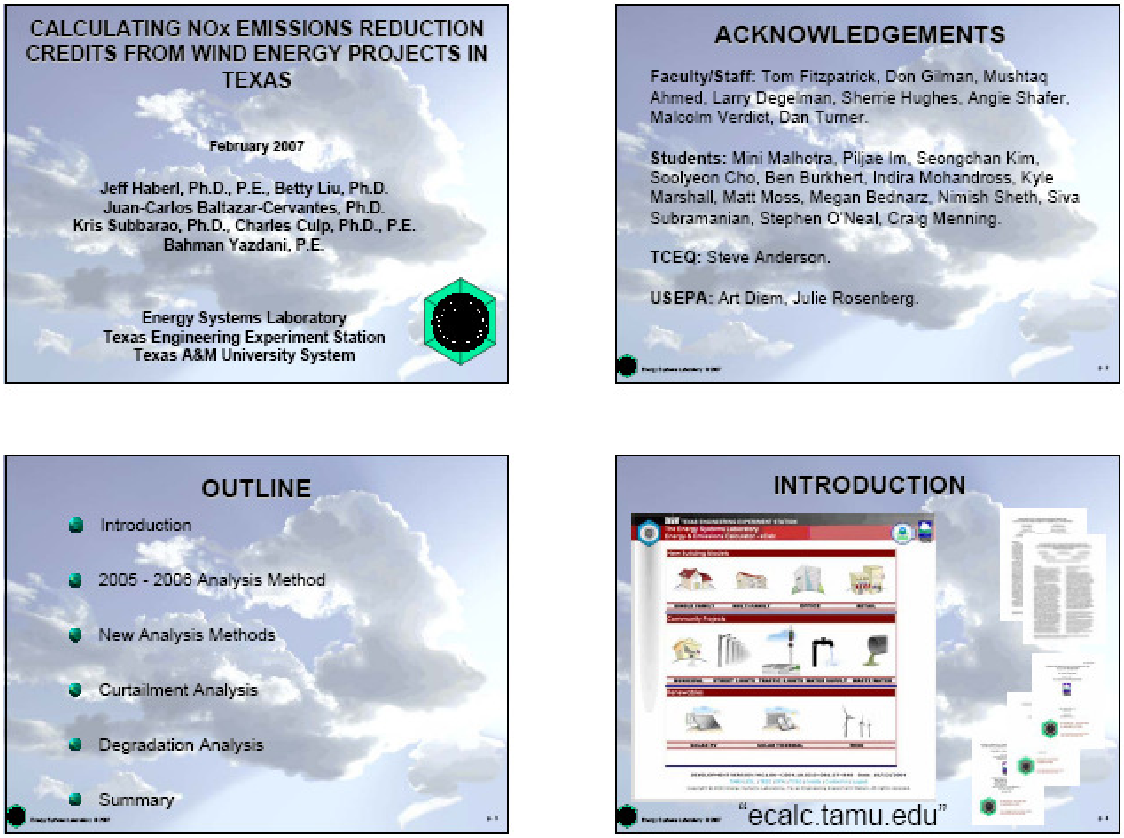
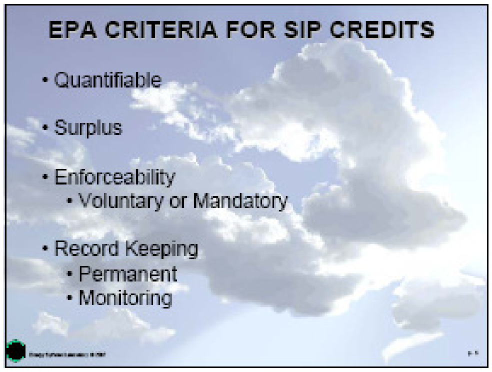
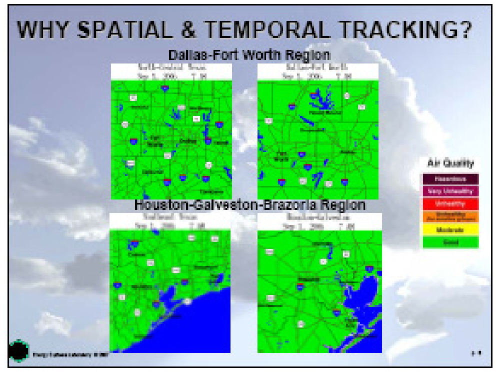
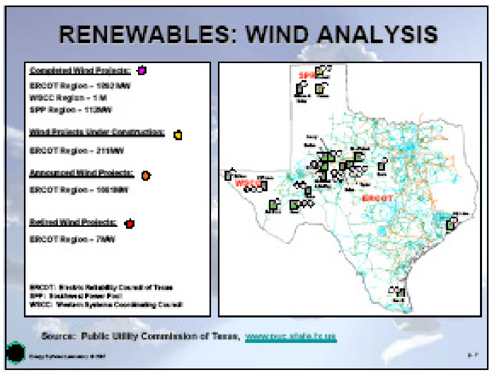
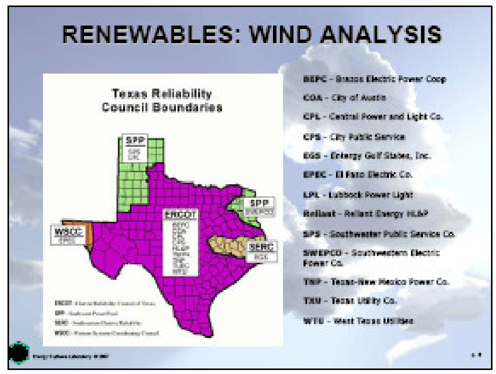


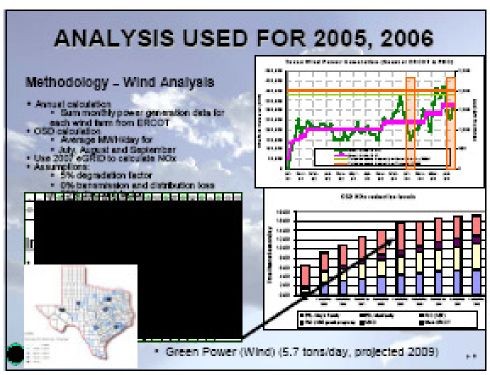
Figure 25: Slides presented at the American Waste Management Association Meeting (February 2007).

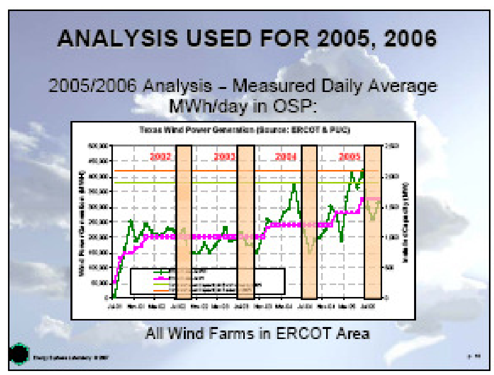


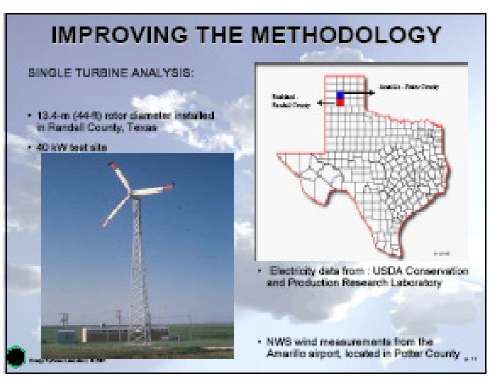












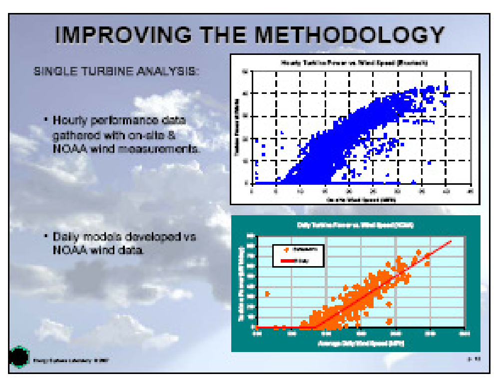
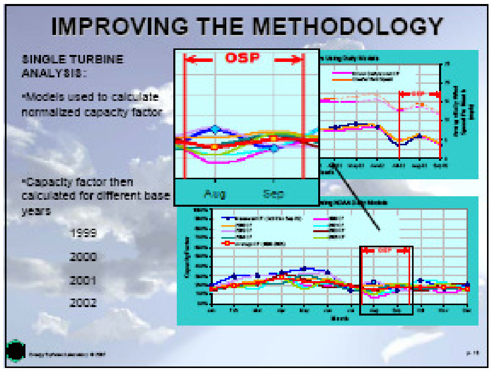
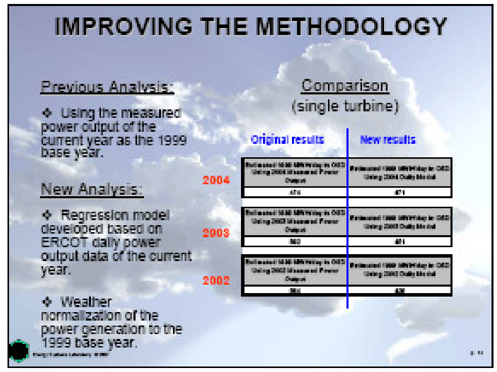
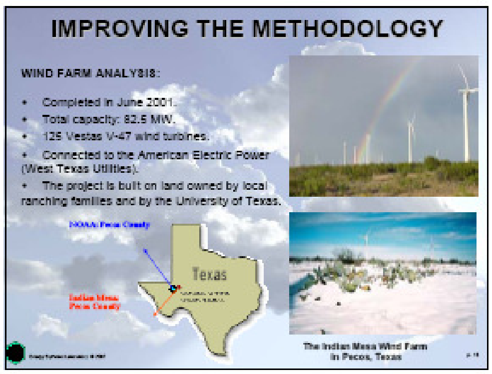
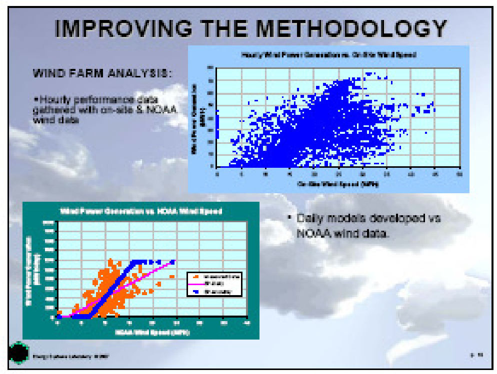


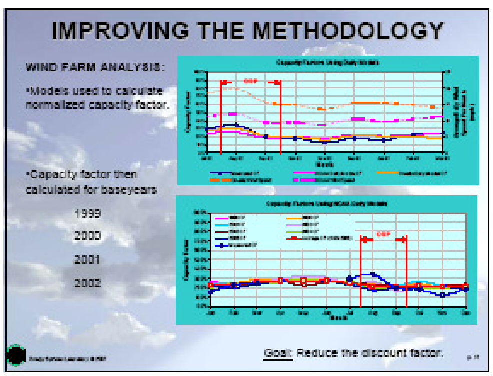
Figure 26: Slides presented at the American Waste Management Association Meeting (February 2007).

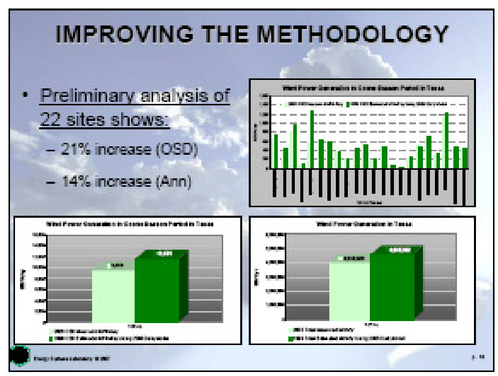


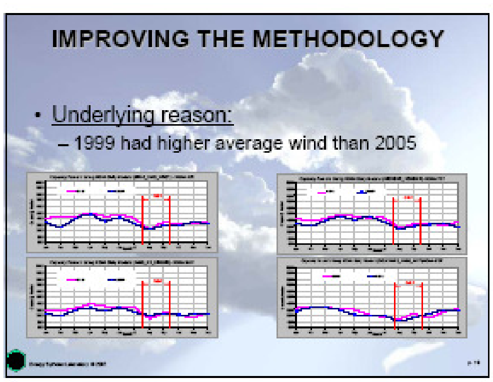












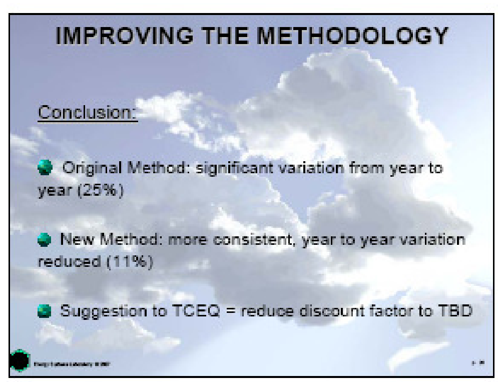
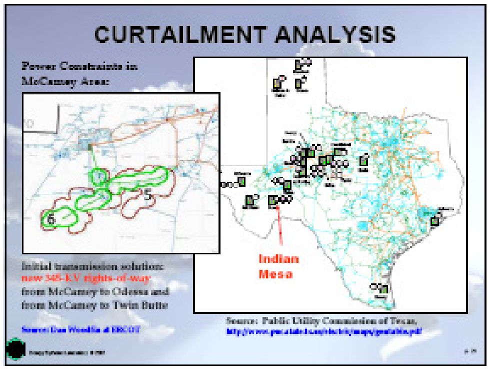
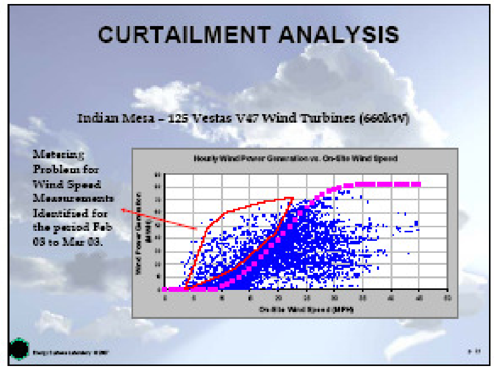
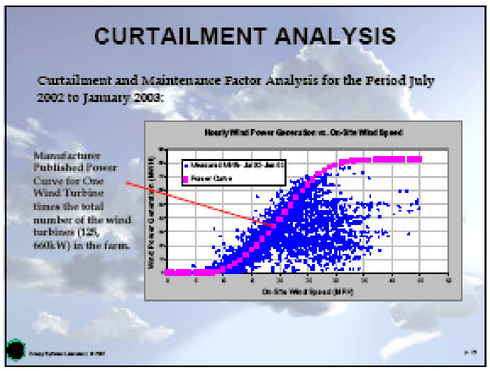
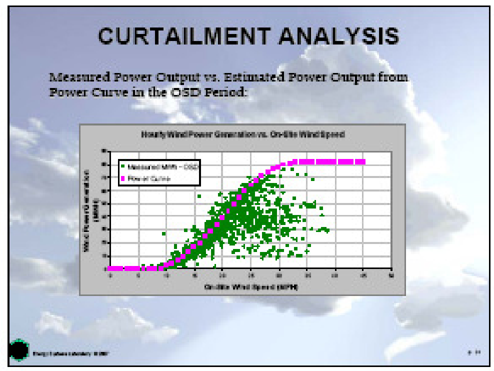


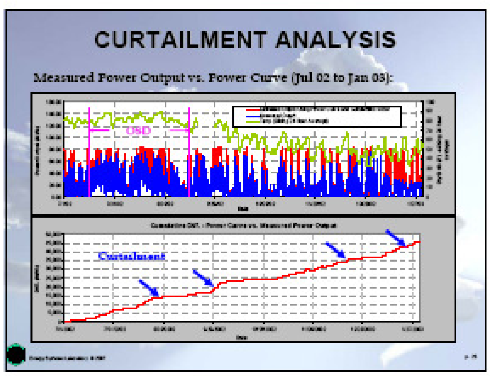
Figure 27: Slides presented at the American Waste Management Association Meeting (February 2007).

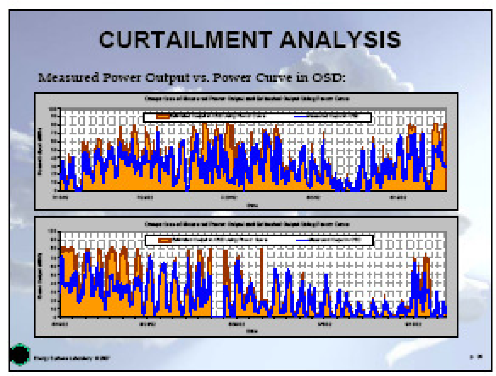


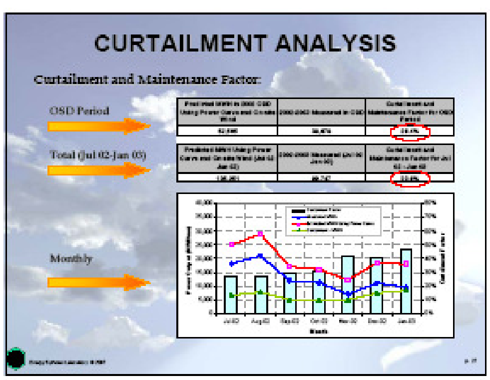












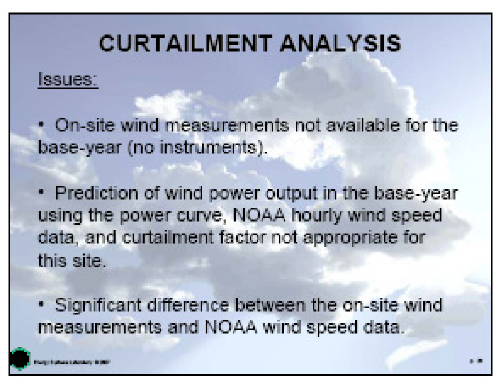
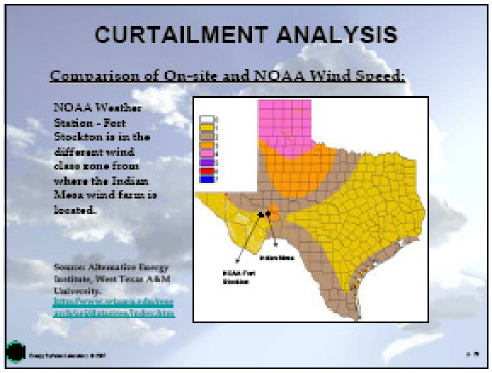
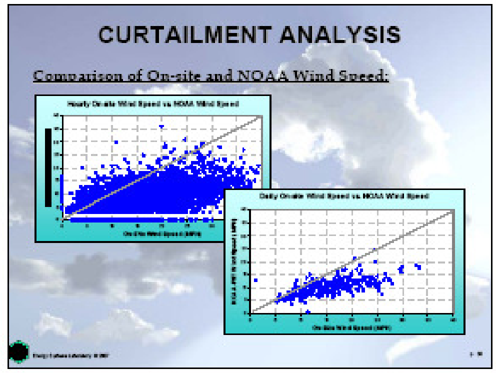
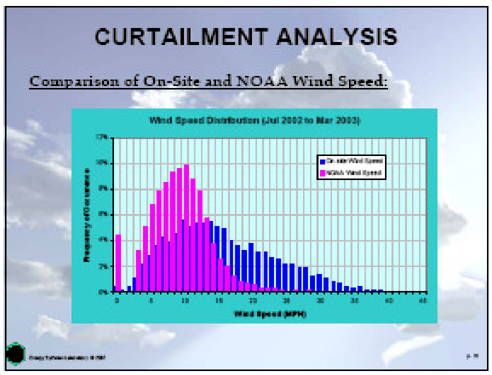
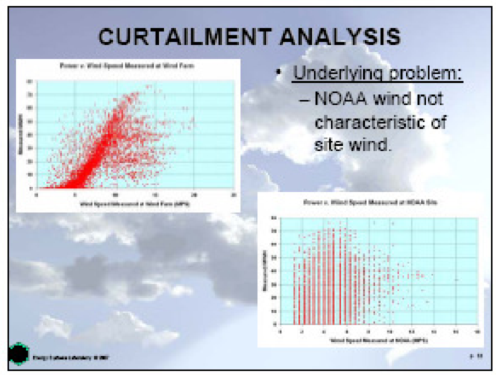


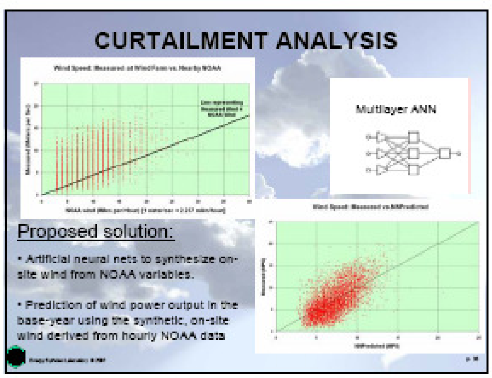
Figure 28: Slides presented at the American Waste Management Association Meeting (February 2007).

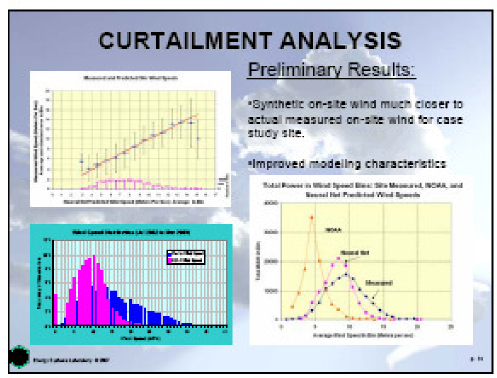


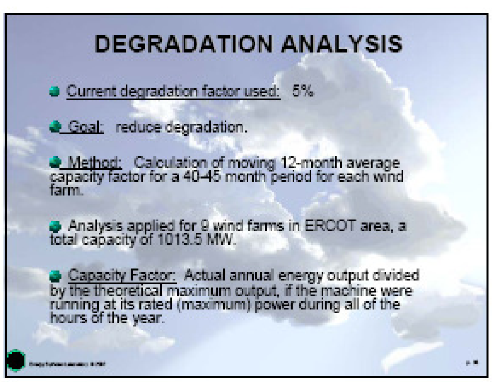












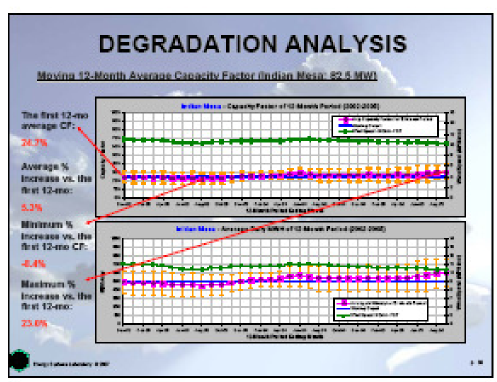
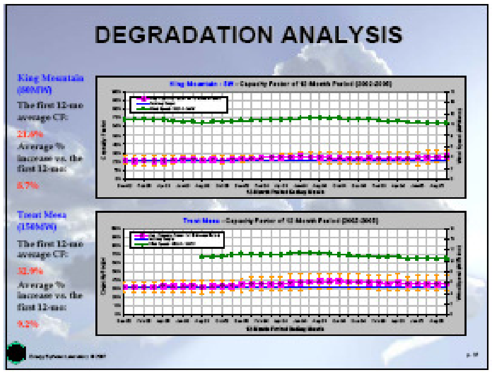
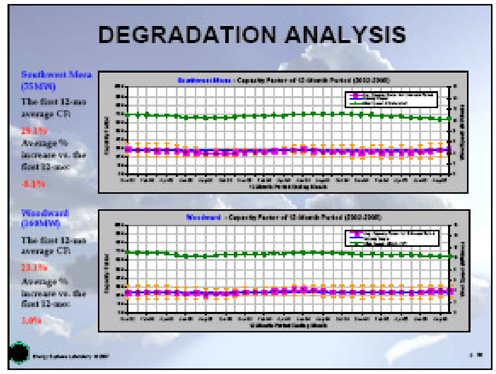
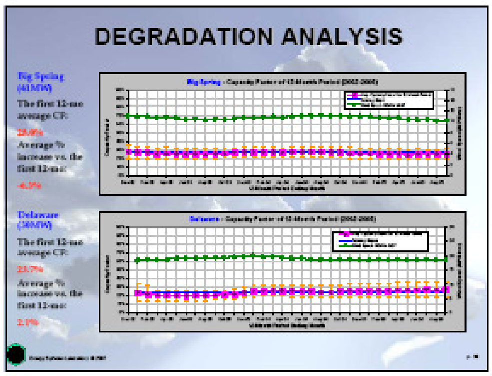
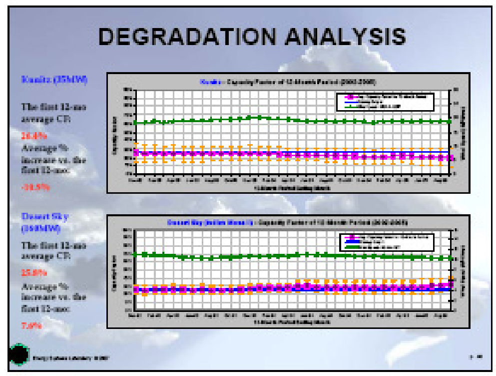


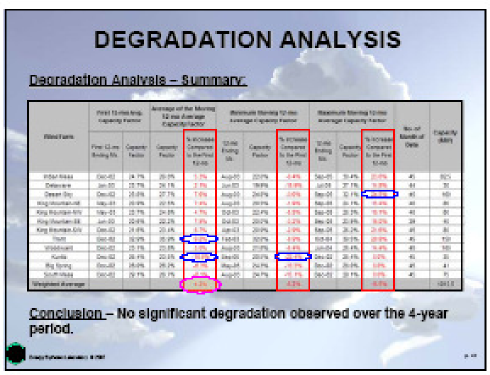
Figure 29: Slides presented at the American Waste Management Association Meeting (February 2007).

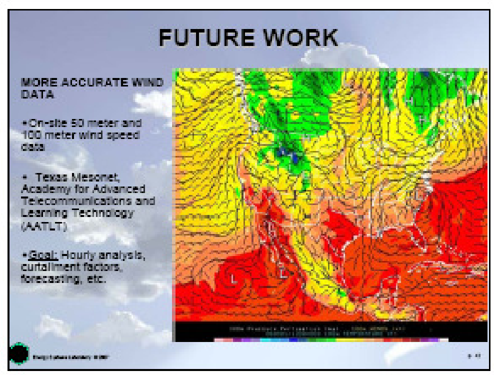


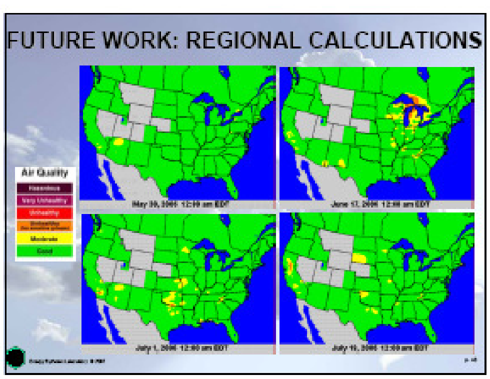












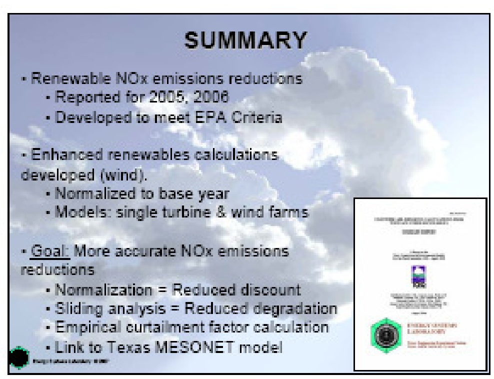
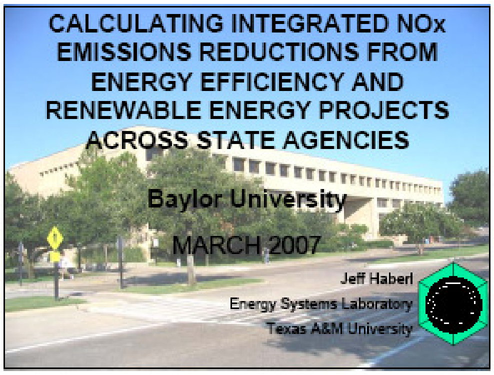
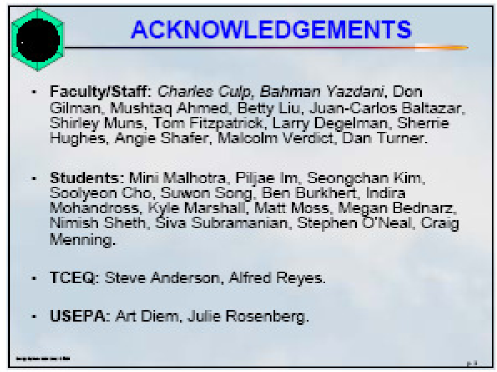


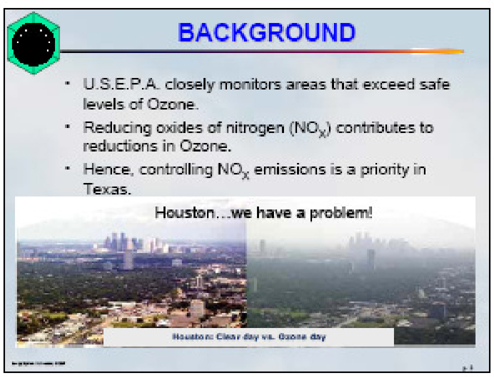
Figure 30: Slides presented at the American Waste Management Association Meeting (February 2007).

5.2.7.2 Presentation at Baylor University, February, 2007

In February 2007, the Laboratory was invited to give a talk to the faculty and graduate students in the Mechanical Engineering Department at Baylor University. This talk covered the development of creditable emissions reductions calculations for EE/RE programs in Texas. The following figures present the slides used in this presentation.







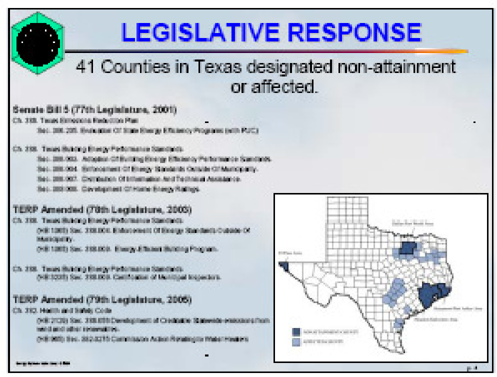
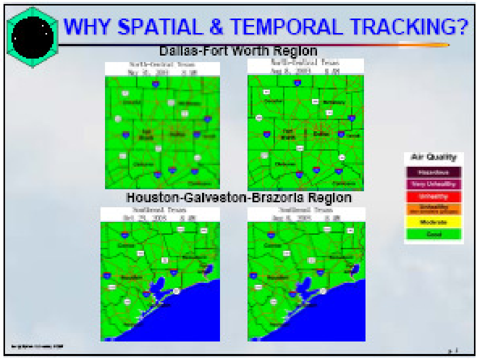
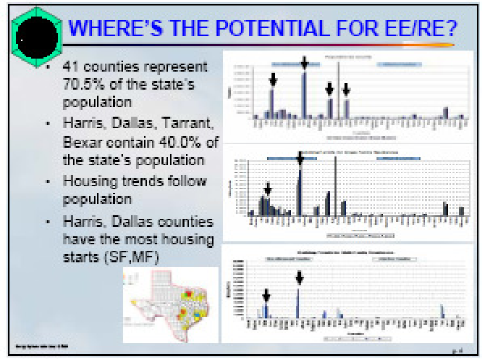
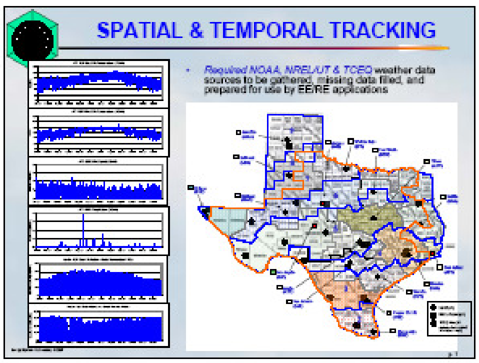
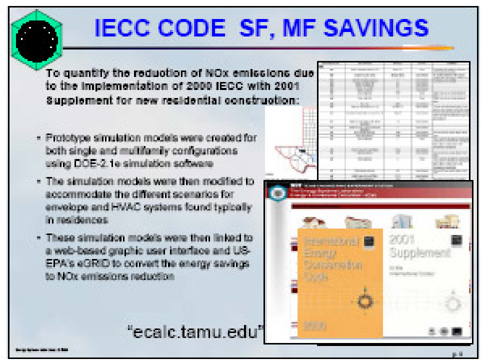


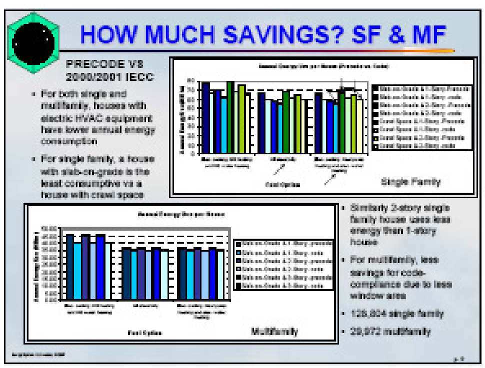
Figure 31: Slides presented at Baylor University (February 2007).

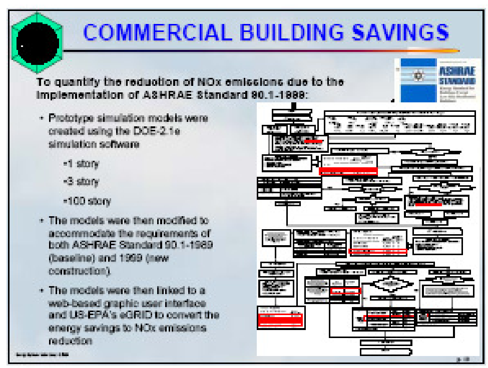


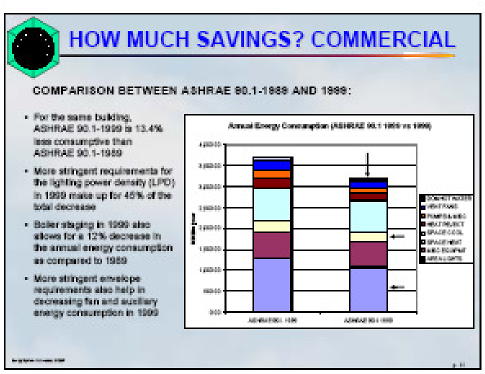












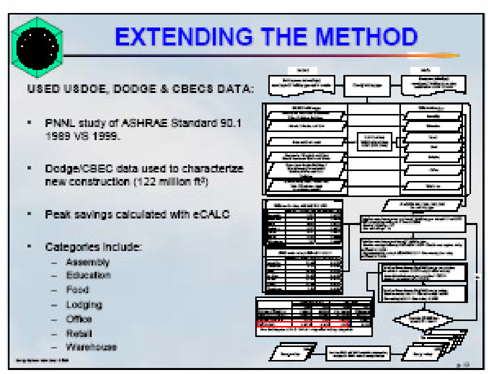
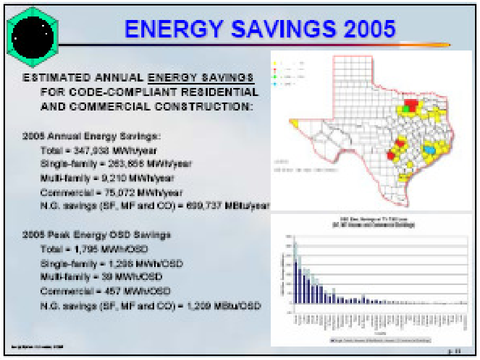
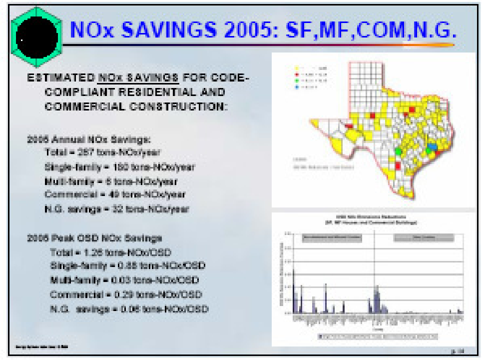
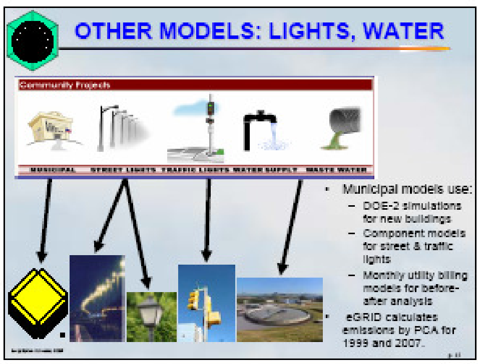
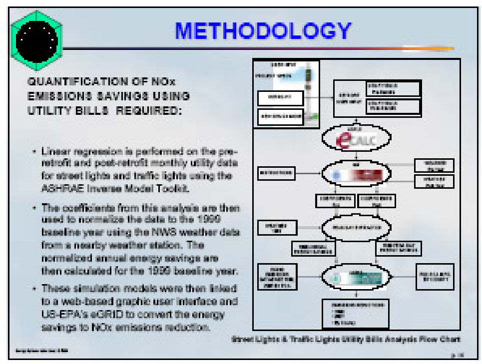


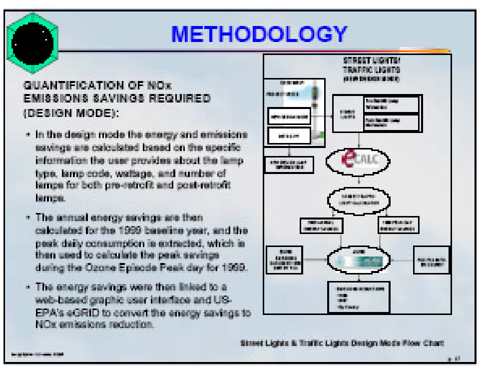
Figure 32: Slides presented at Baylor University (February 2007).

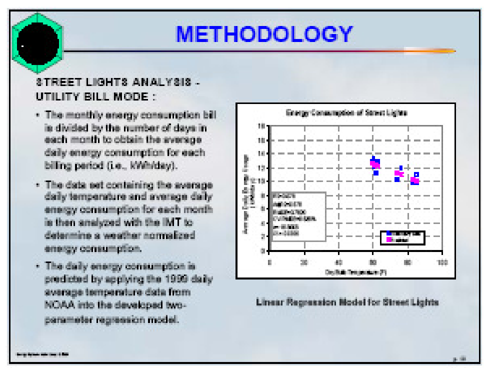


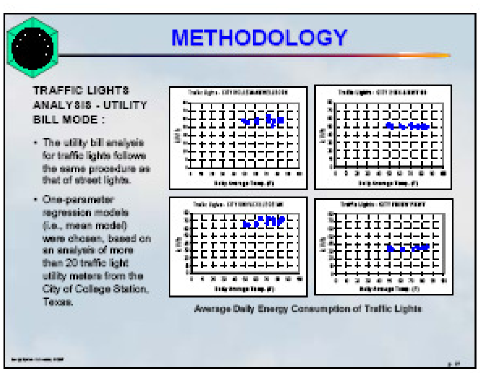












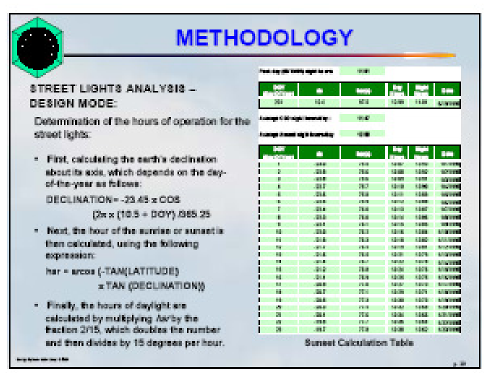
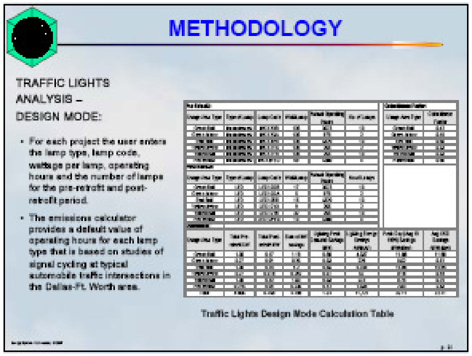
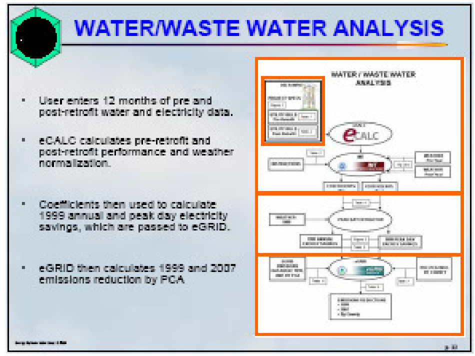
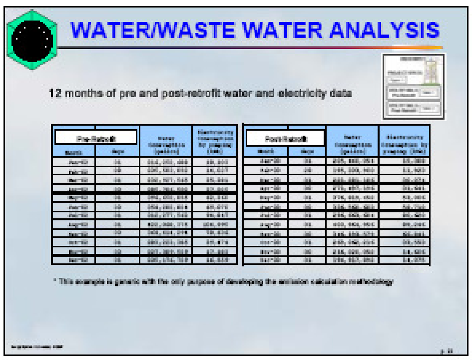
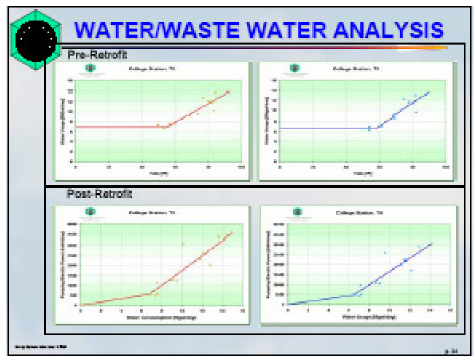


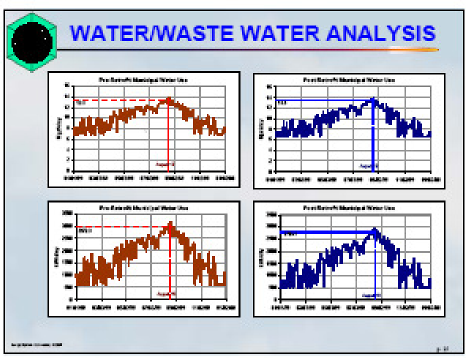
Figure 33: Slides presented at Baylor University (February 2007).

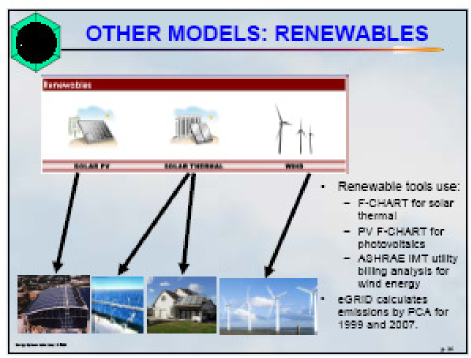


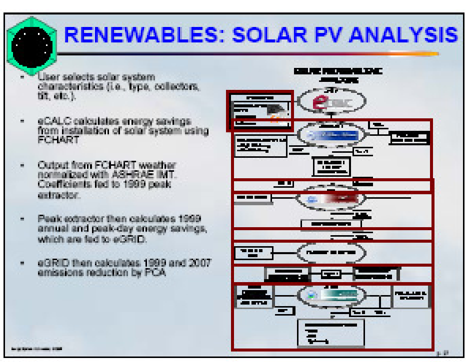












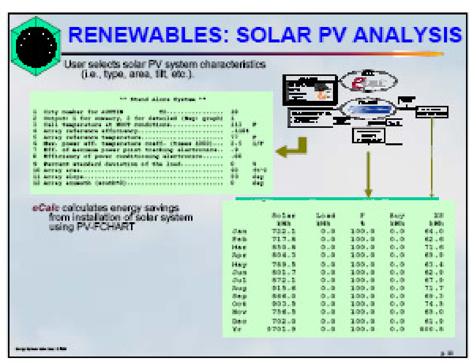
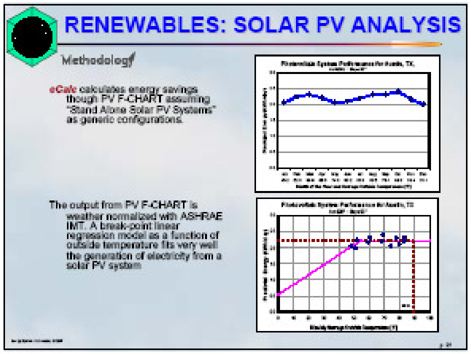
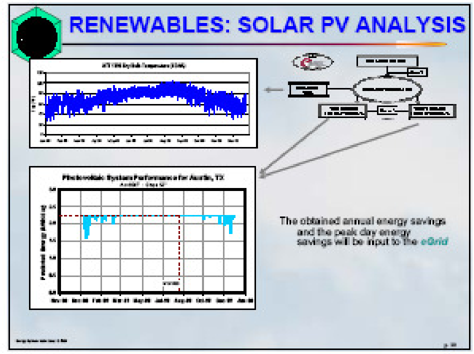
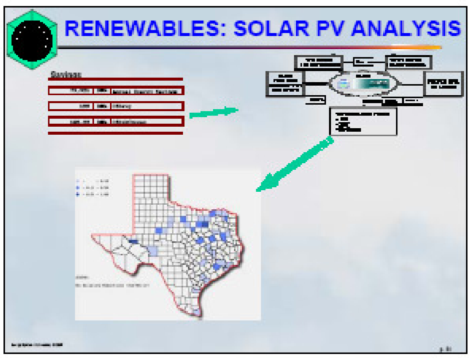
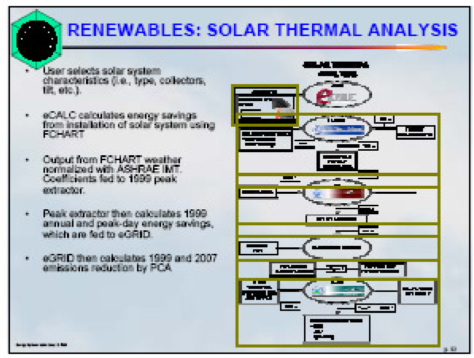


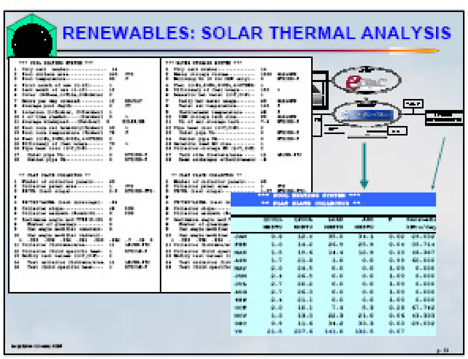
Figure 34: Slides presented at Baylor University (February 2007).

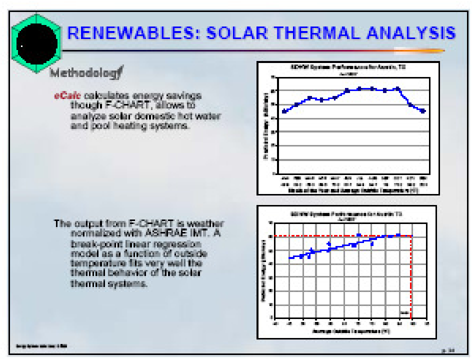


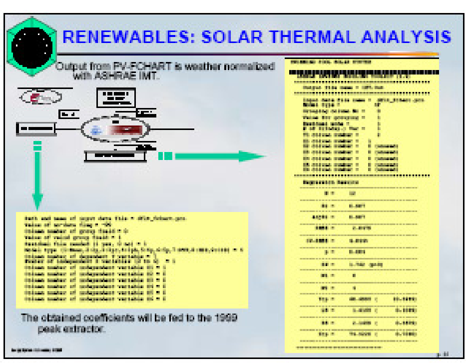












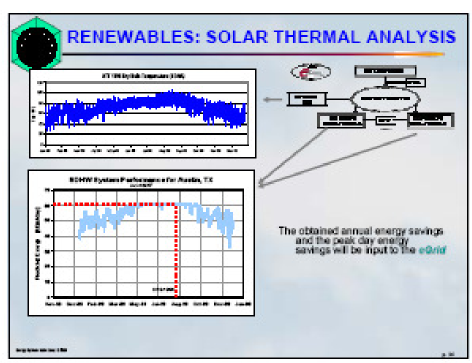
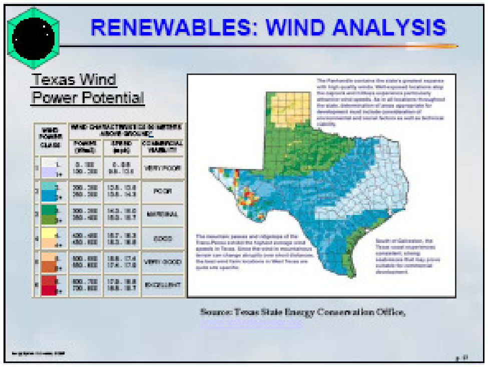
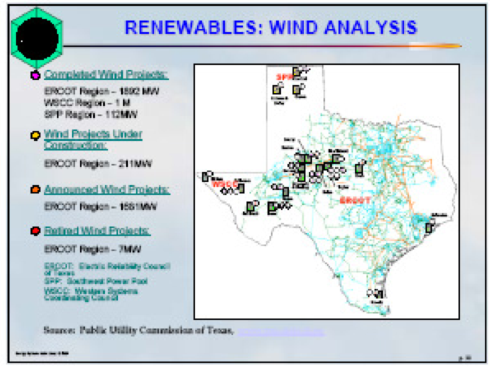
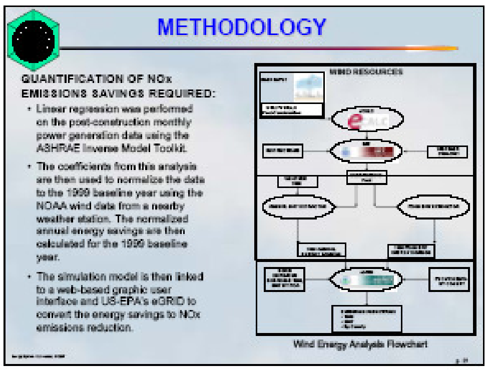
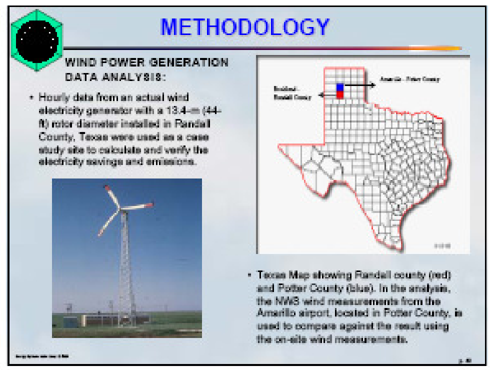


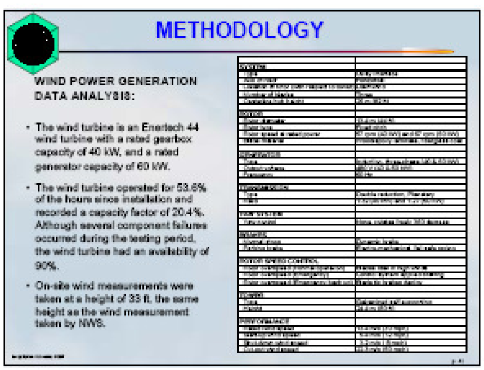
Figure 35: Slides presented at Baylor University (February 2007).

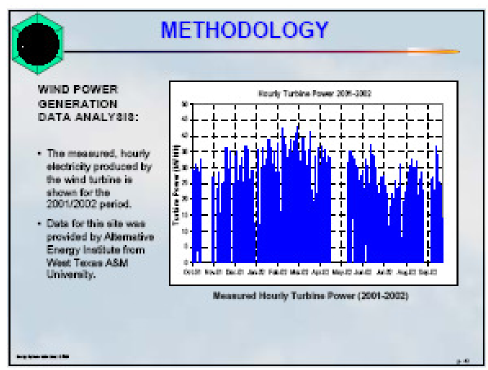


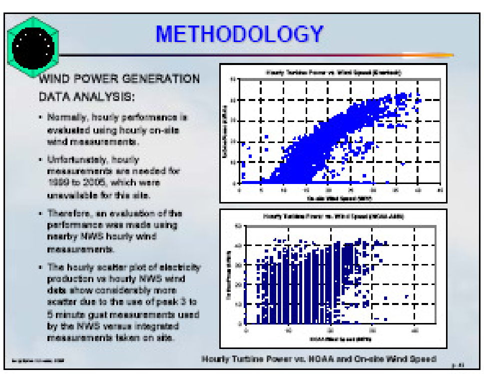












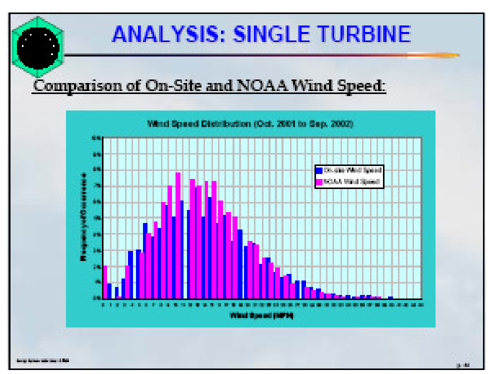
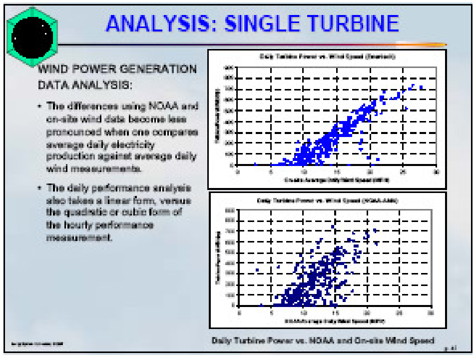
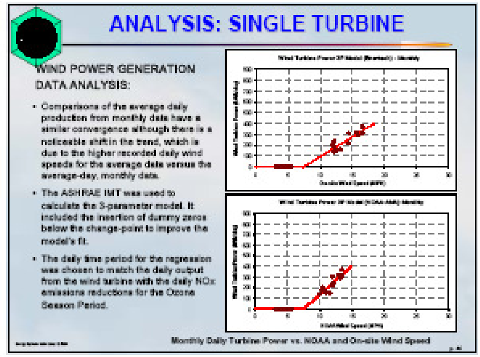
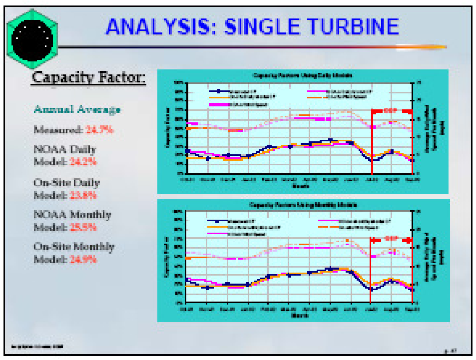
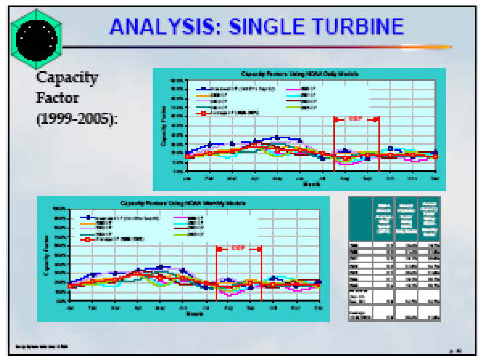


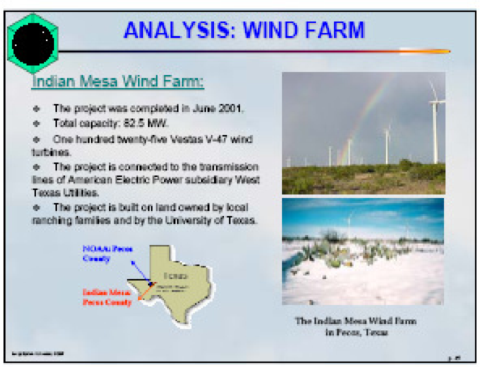
Figure 36: Slides presented at Baylor University (February 2007).

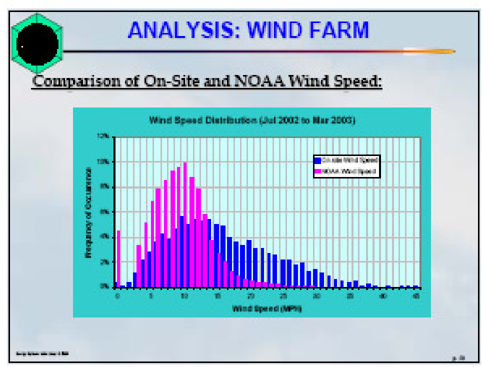


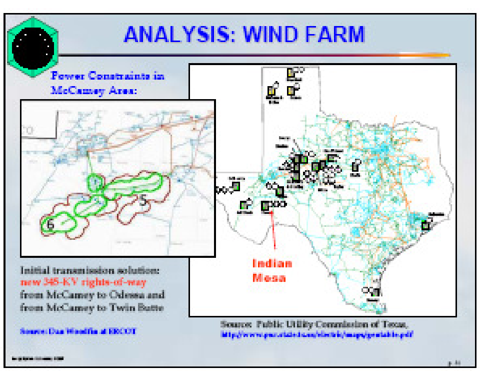












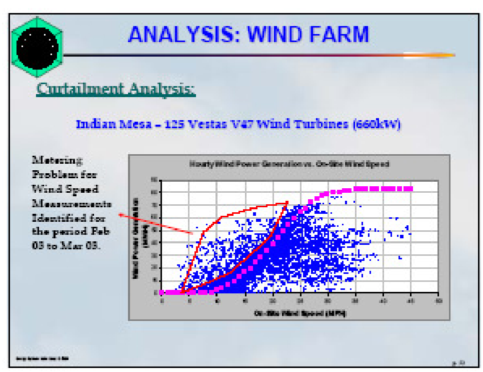


Figure 37: Slides presented at Baylor University (February 2007).

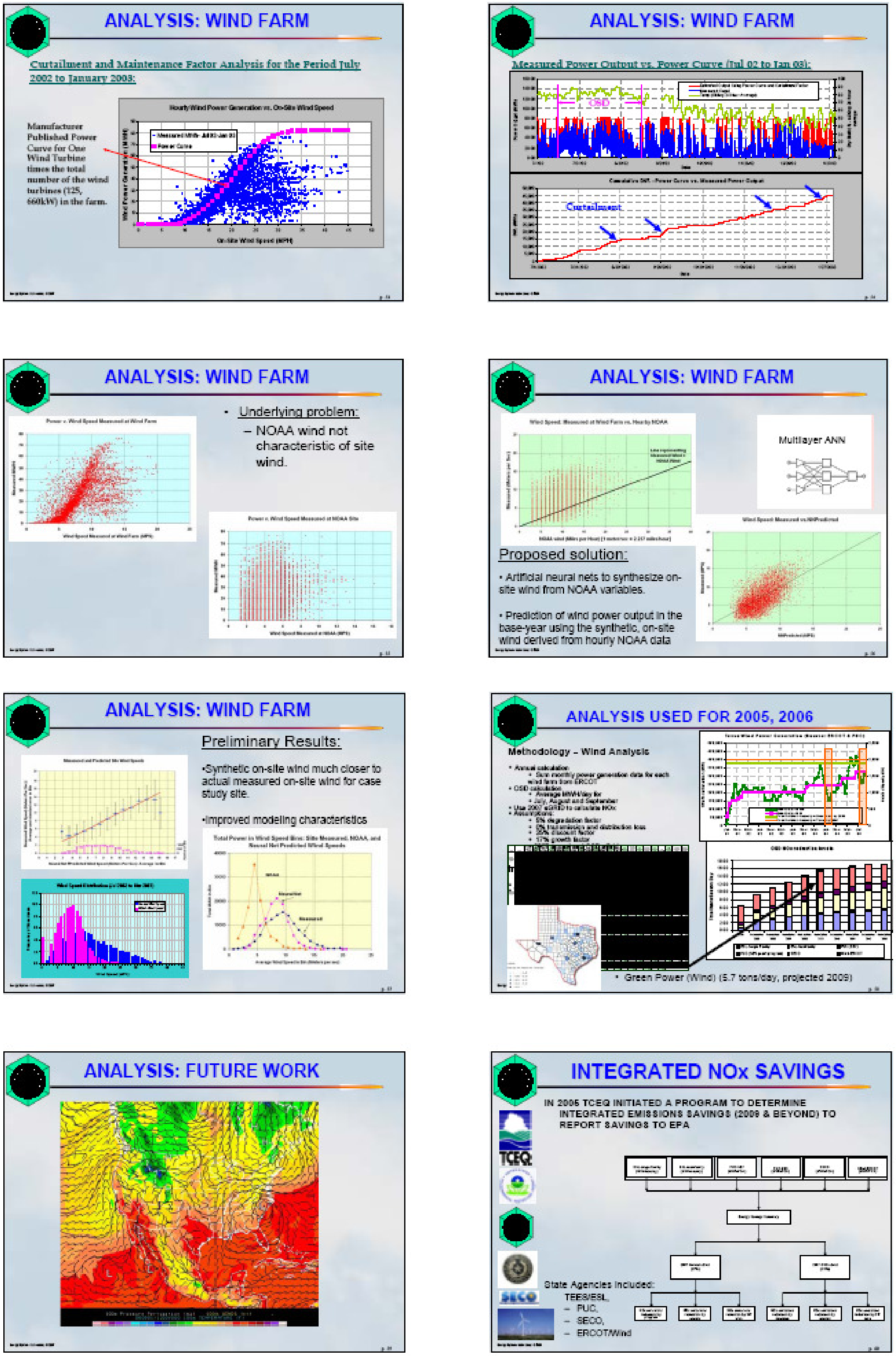
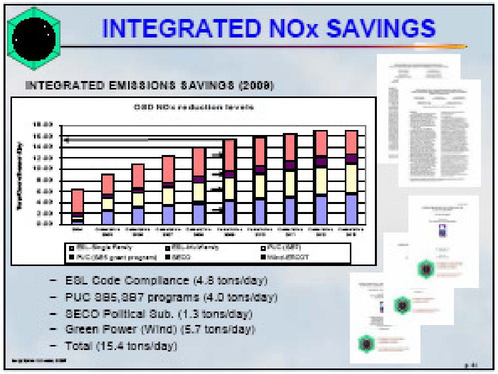
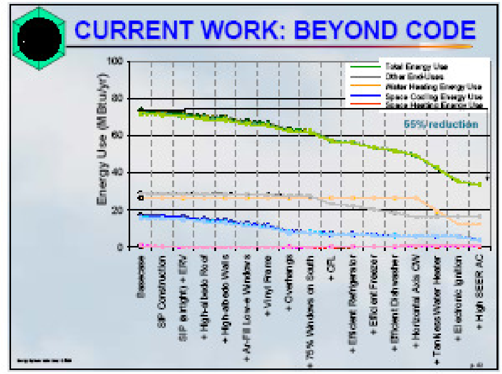


Figure 38: Slides presented at Baylor University (February 2007).





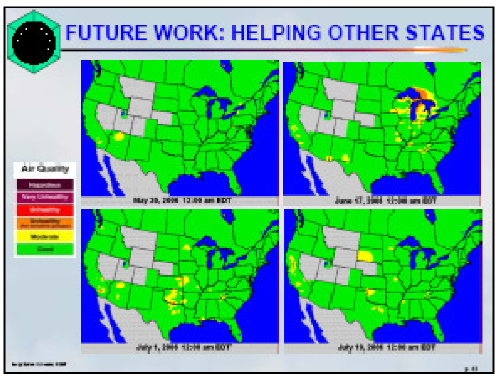
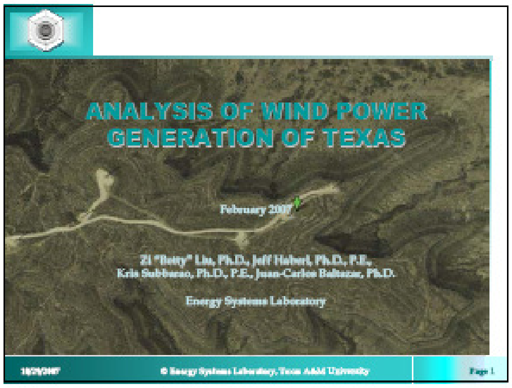
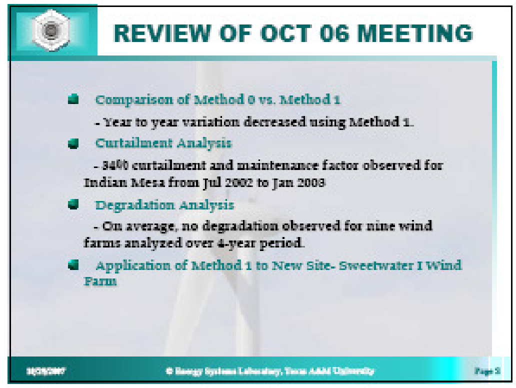


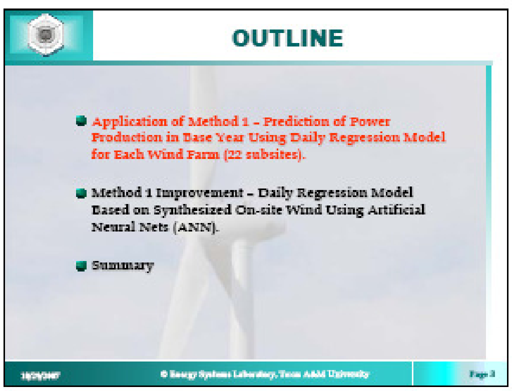
Figure 39: Slides presented at Baylor University (February 2007).

5.2.7.2.1 February 2007 Wind Stakeholders conference call.

In February 2007, the Laboratory presented an update to the analysis methods, including work performed since October 2006. These results were presented in the format of a conference call to the Stakeholders. The following figures present the slides used in this presentation.







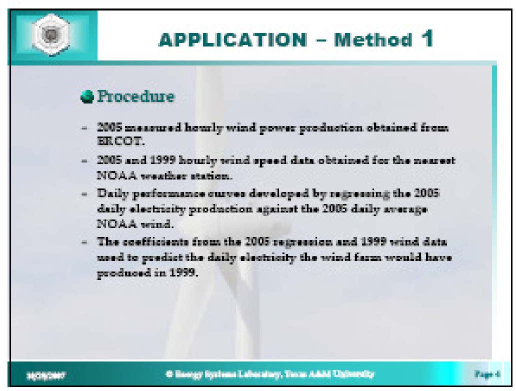
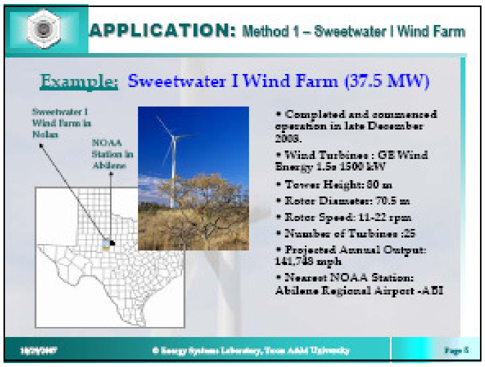
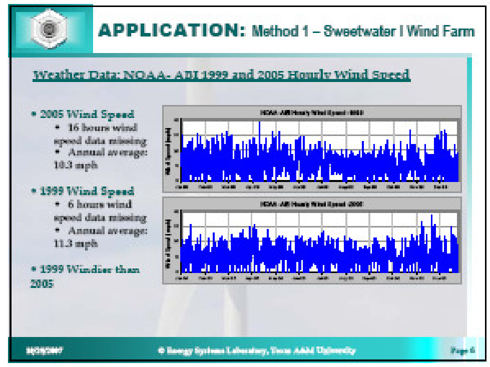
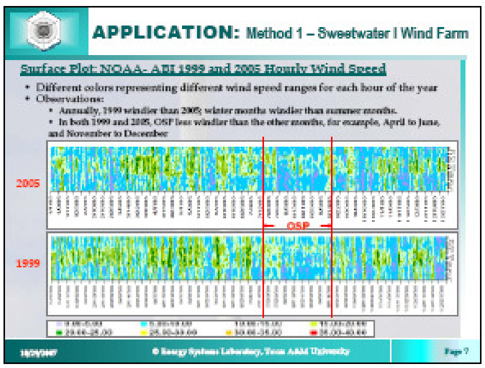
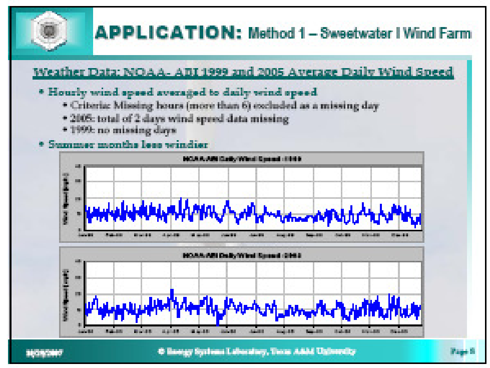


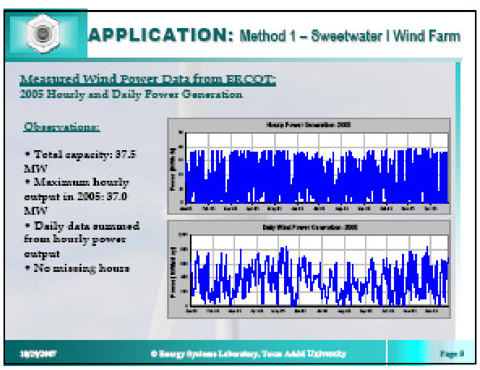
Figure 40: Slides presented at the Wind Energy Stakeholder's conference call (February 2007).

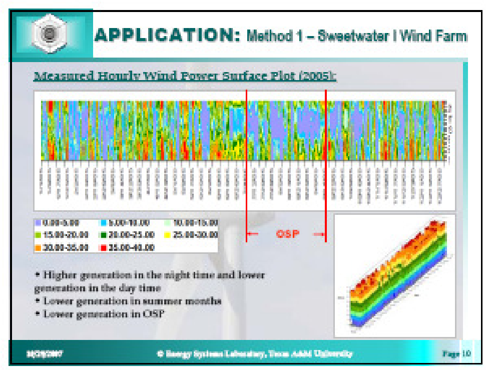


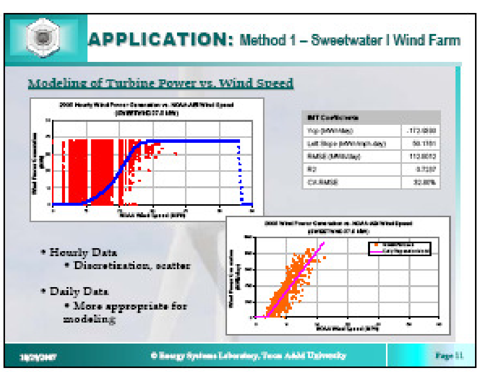












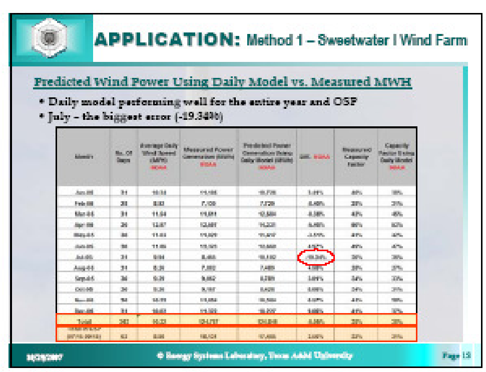
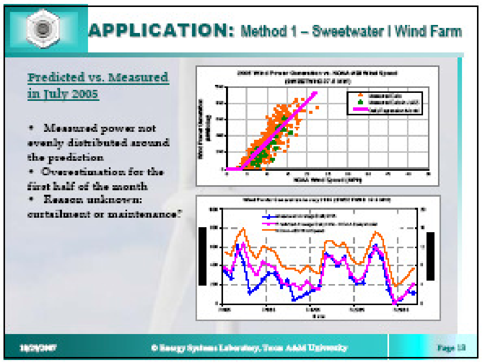
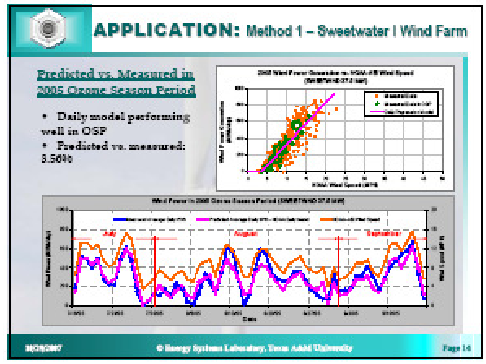
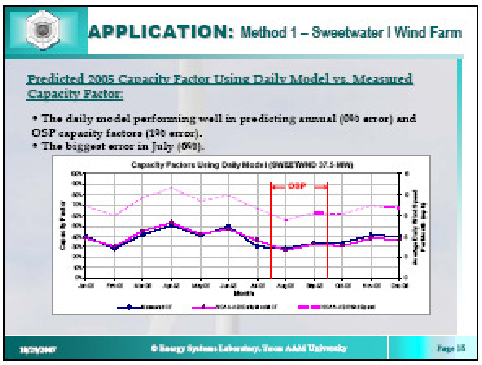
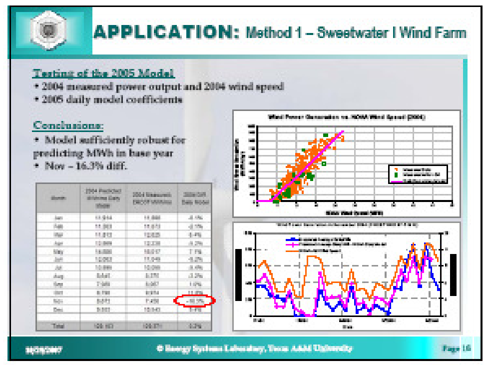


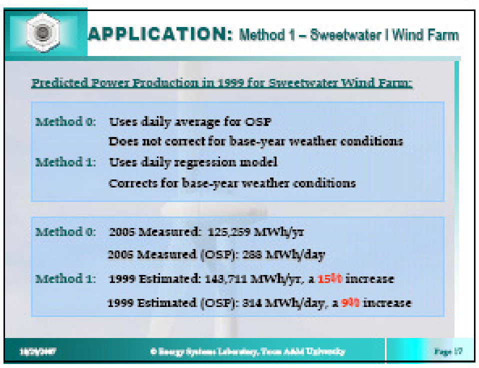
Figure 41: Slides presented at the Wind Energy Stakeholder's conference call (February 2007).

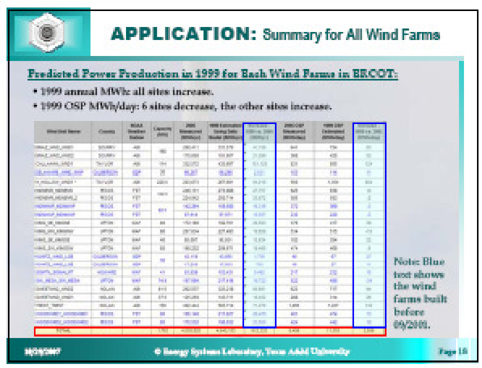


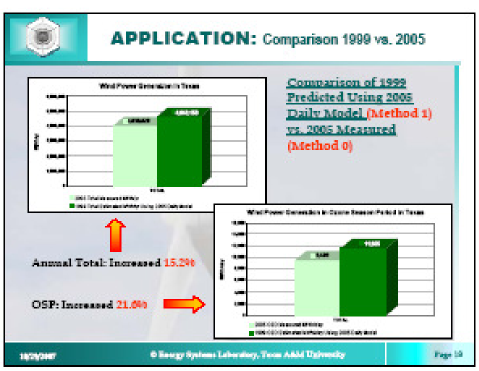












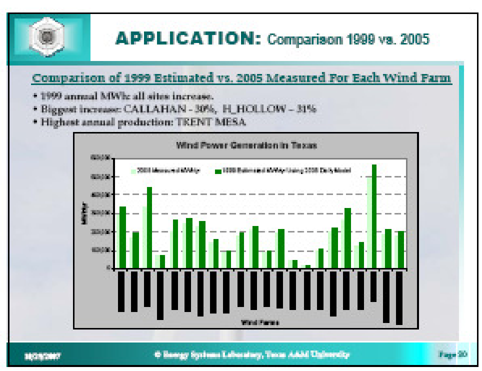
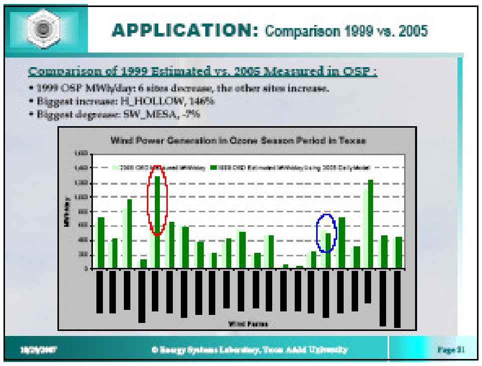
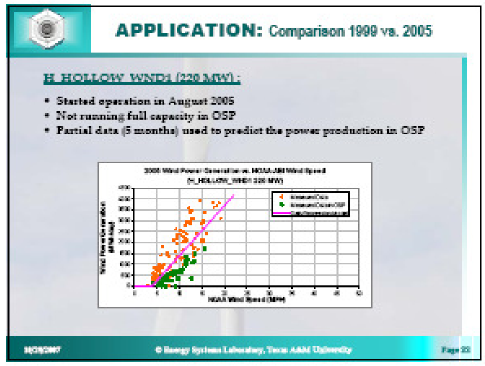
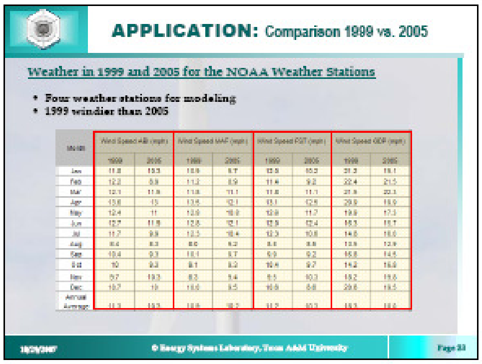
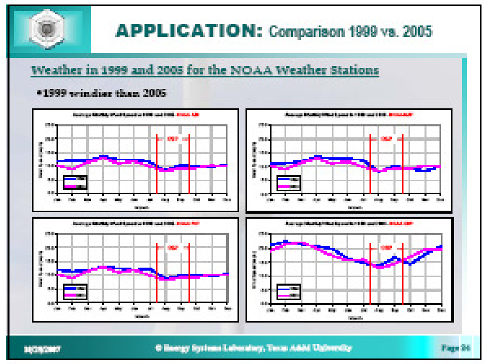


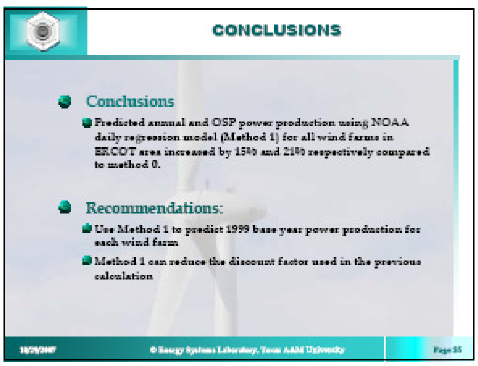
Figure 42: Slides presented at the Wind Energy Stakeholder's conference call (February 2007).

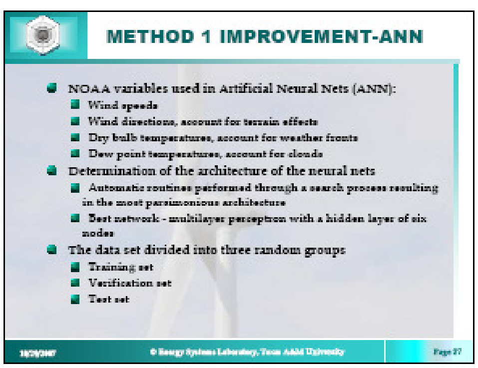












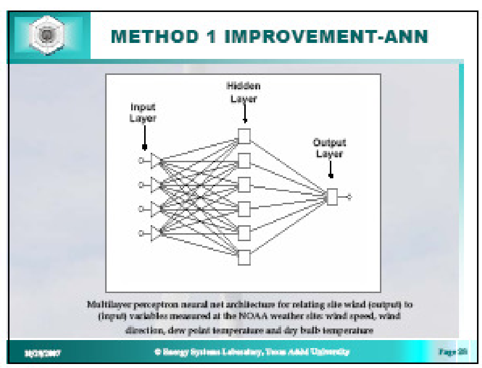


Figure 43: Slides presented at the Wind Energy Stakeholder's conference call (February 2007).

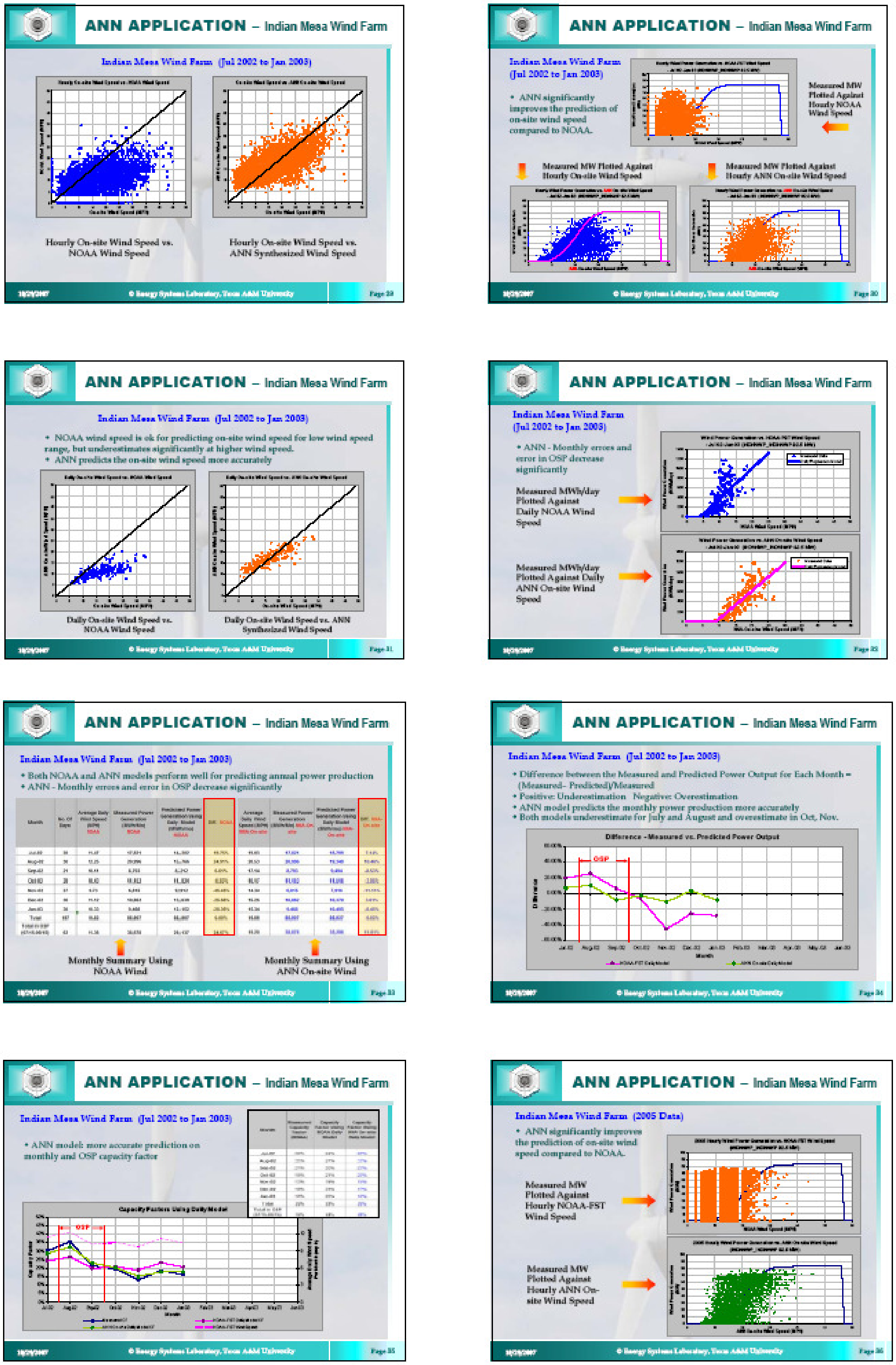
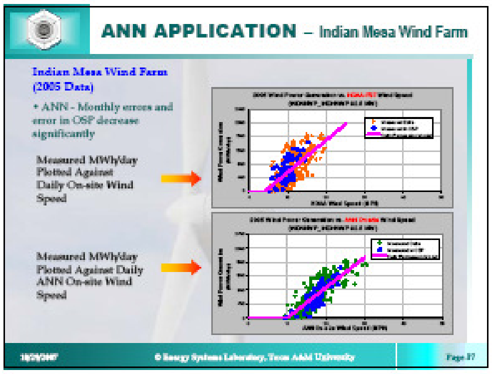
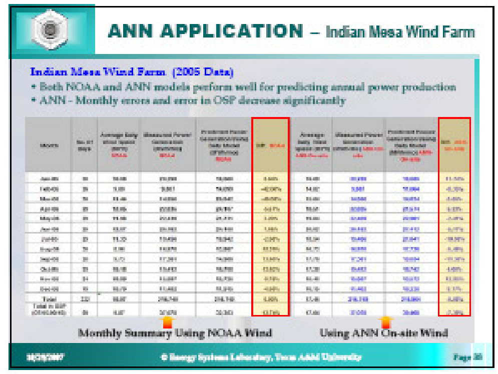
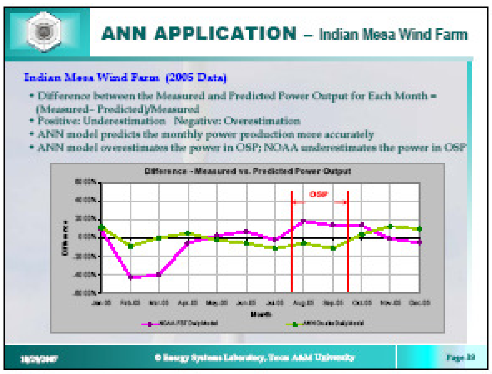
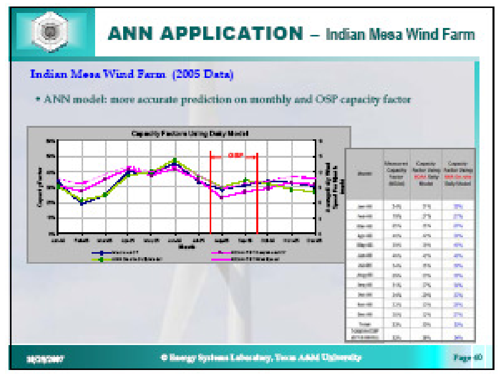


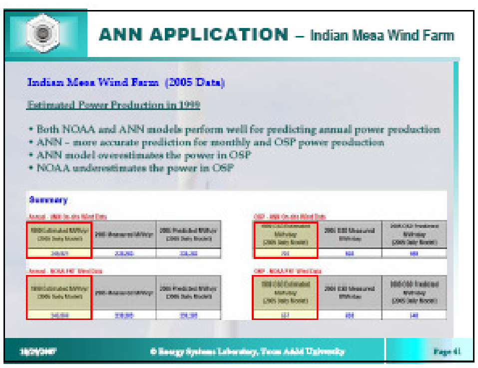
Figure 44: Slides presented at the Wind Energy Stakeholder's conference call (February 2007).

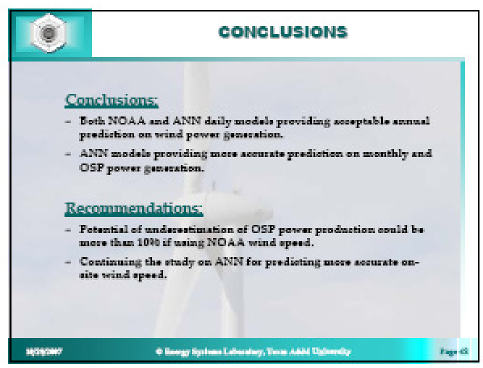












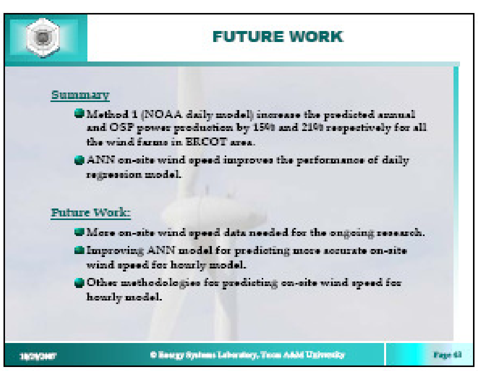
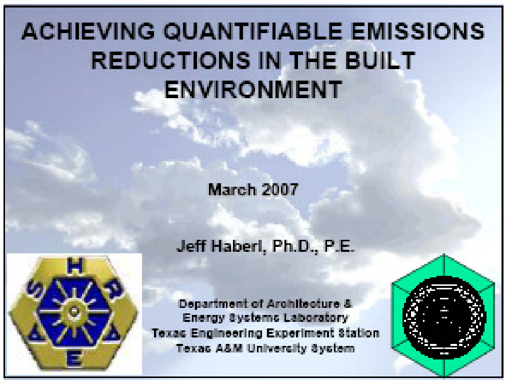
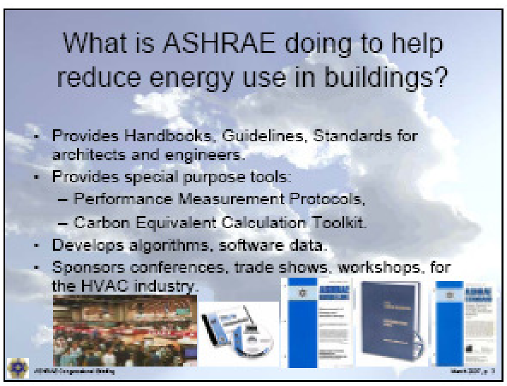


Figure 45: Slides presented at the Wind Energy Stakeholder's conference call (February 2007).

5.2.7.3 Presentation at U.S. Congress for ASHRAE Tech Briefing

In March 2007, the Laboratory was asked to make a presentation to the U.S. Congress regarding the progress that has been made in Texas to quantify emissions credits from energy efficiency and renewable energy projects. This presentation included overview material on ASHRAE's efforts to assist engineers and architects in reducing energy use, as well as information about the Laboratory's effort to quantify emissions credits from energy efficiency and renewable energy projects. The following slides presents the materials presented to U.S.Congressional staff.





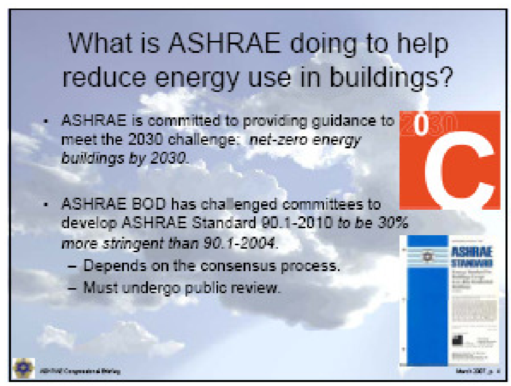
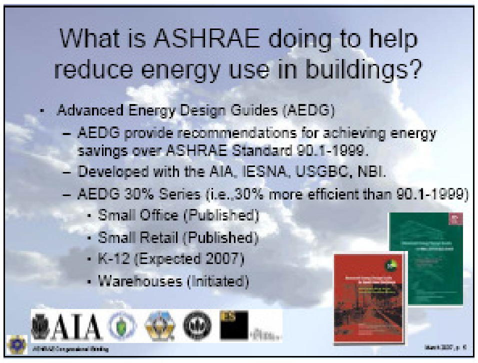
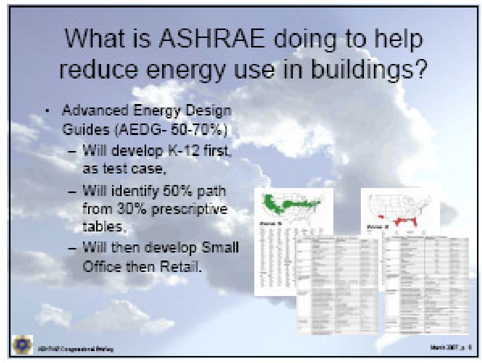
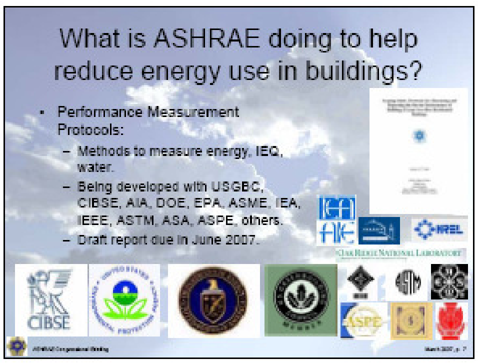
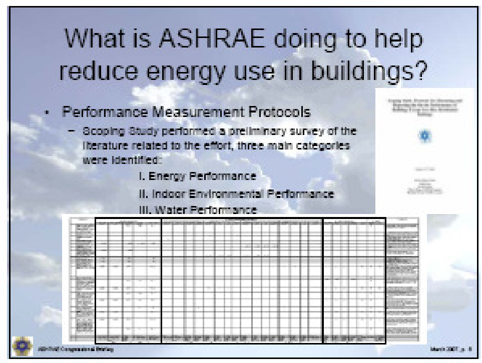


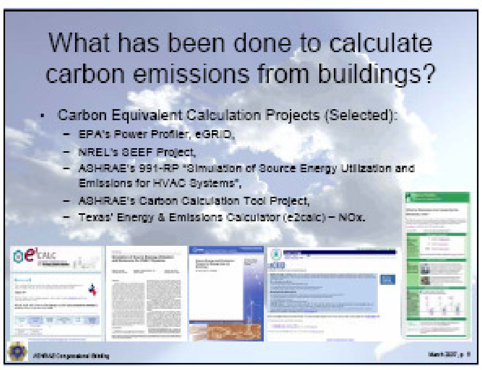
Figure 46: Slides presented to the U.S. Congressional Staff (March 2007).

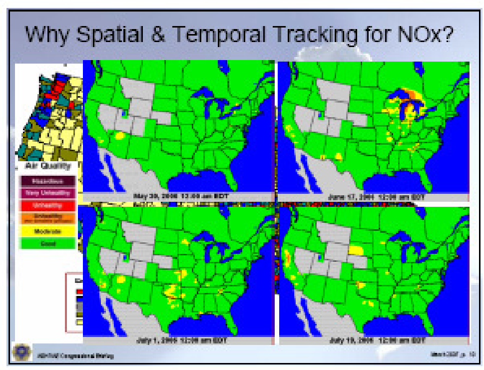












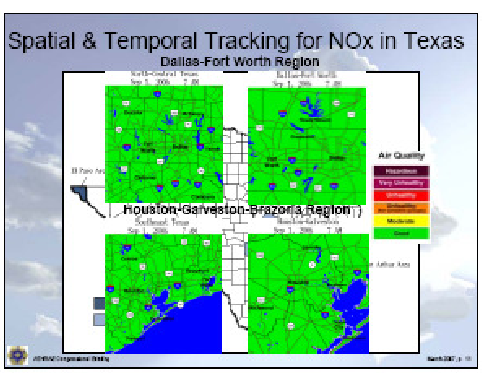
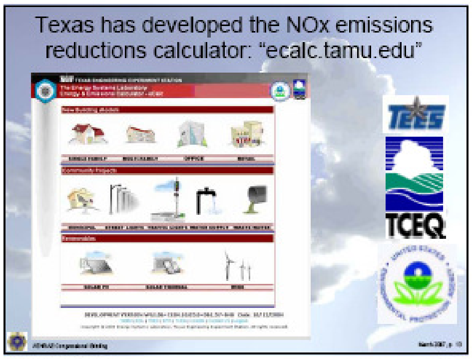
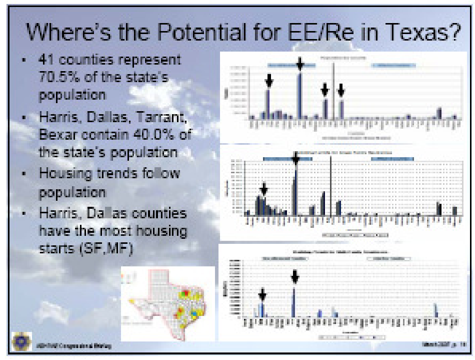
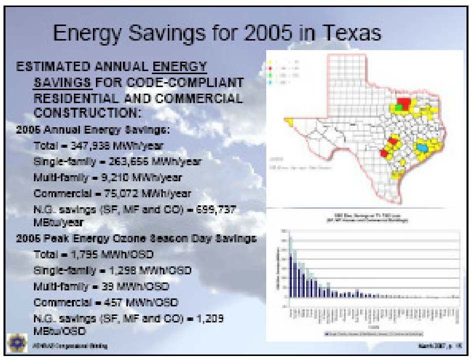
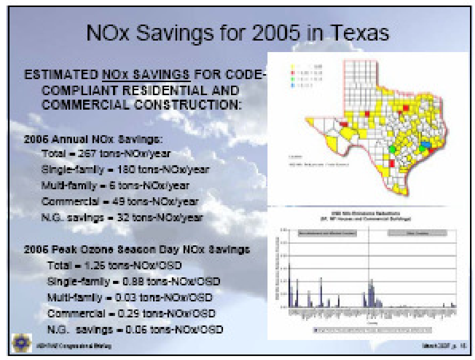


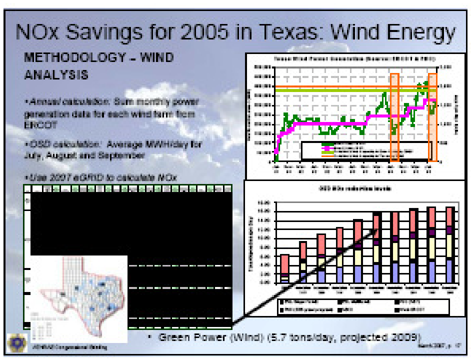
Figure 47: Slides presented to the U.S. Congressional Staff (March 2007).

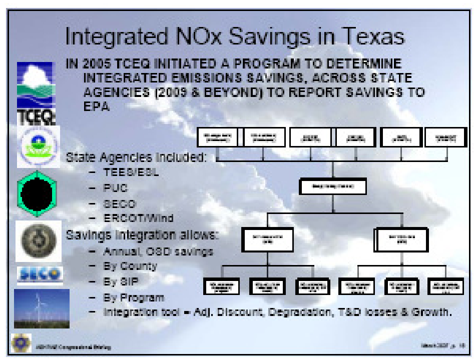


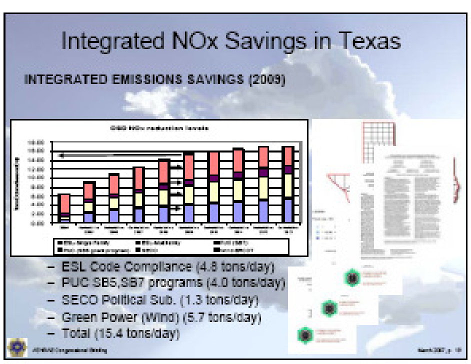












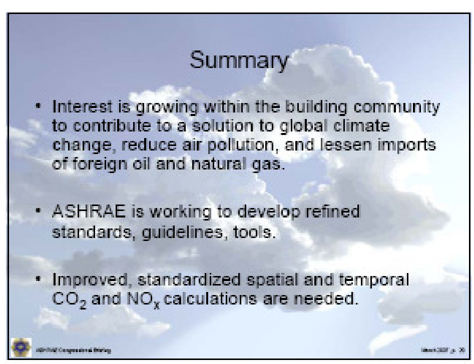
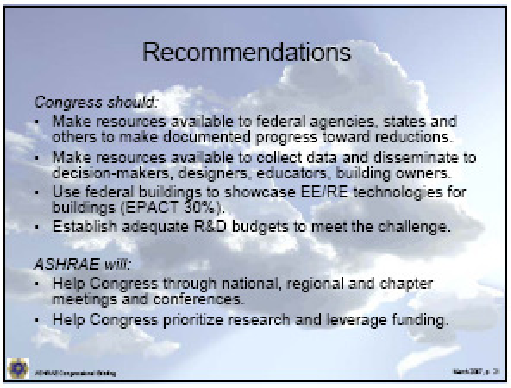


Figure 48: Slides presented to the U.S. Congressional Staff (March 2007).



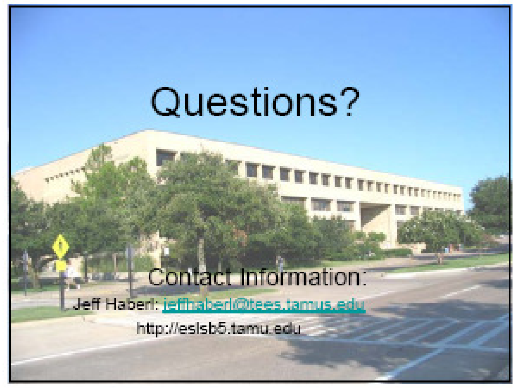
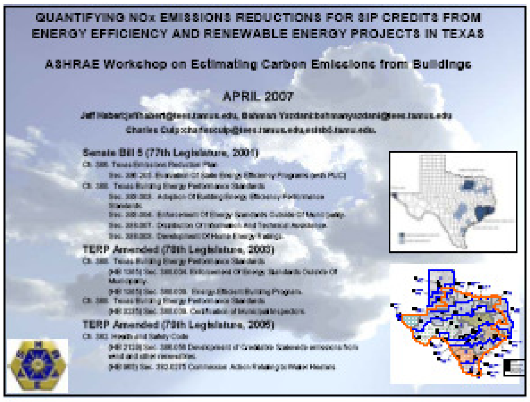
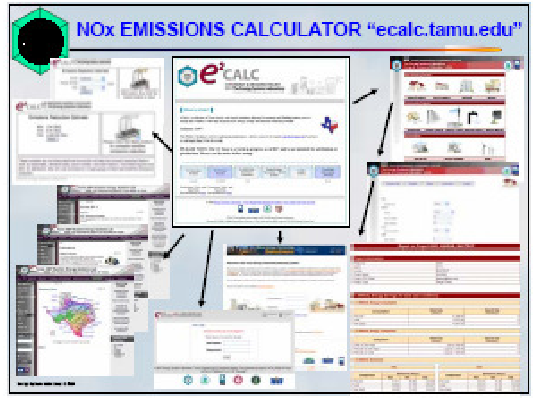


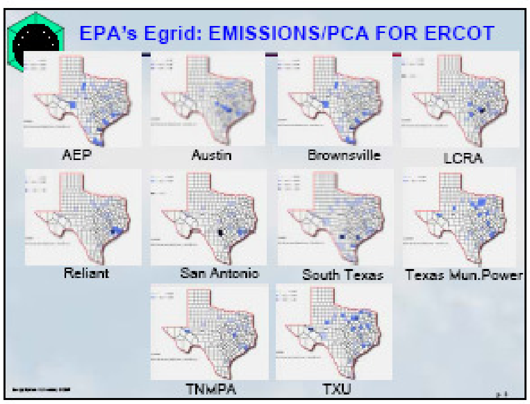
Figure 49: Slides presented to the U.S. Congressional Staff (March 2007).

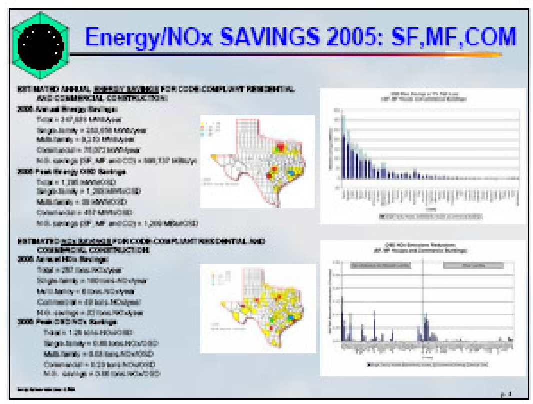
5.2.7.4 Presentation at ASHRAE Carbon Toolkit Workshop (by phone)

In April 2007, the Laboratory was asked to participate in an ASHRAE Special Project to determine the feasibility of developing a Carbon Emissions Toolkit. This presentation reviewed the development of creditable emissions reductions calculations for EE/RE programs in Texas. The following figures present the slides used in this presentation.









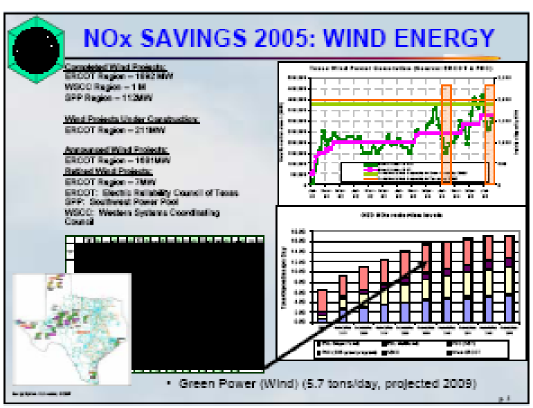
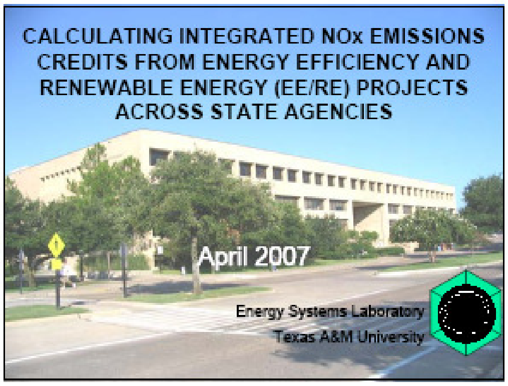
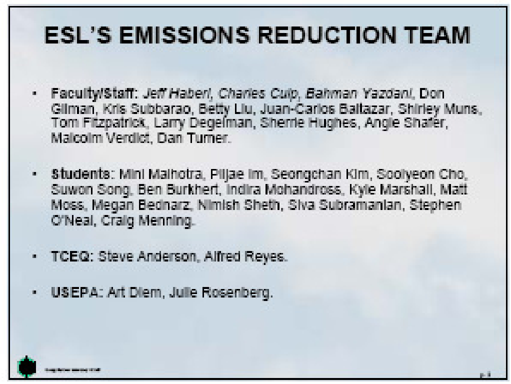


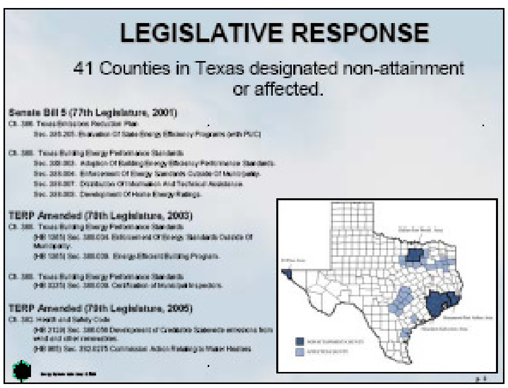
Figure 50: Slides presented at the ASHRAE Carbon Toolkit Workshop (April 2007).

5.2.7.5 Presentation at EPRI Conference, April 2007 (by phone).

In April 2007, the Laboratory was asked to participate in an EPRI Conference Call. This presentation reviewed the development of creditable emissions reductions calculations for EE/RE programs in Texas. The following figures present the slides used in this presentation.







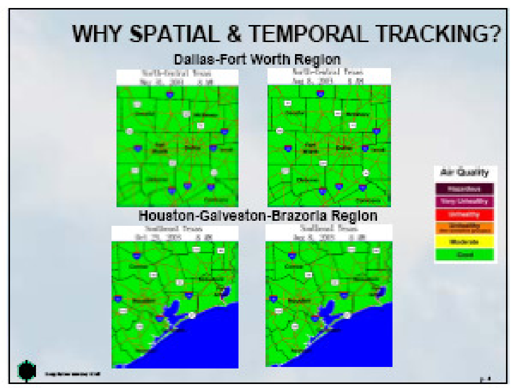


Figure 51: Slides presented at the EPRI Conference Call (April 2007).

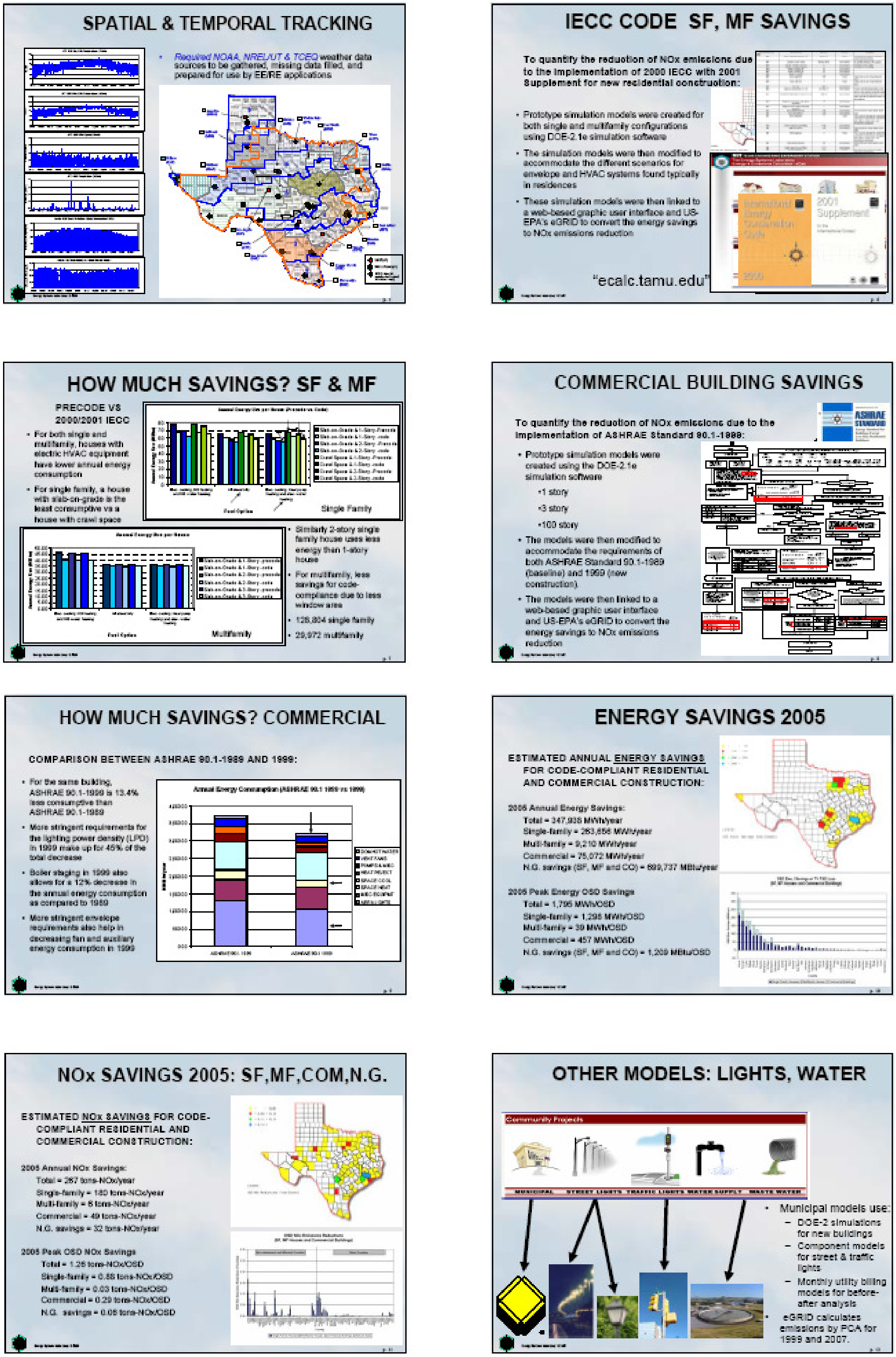
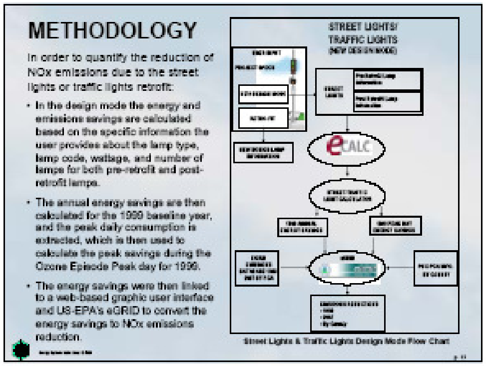
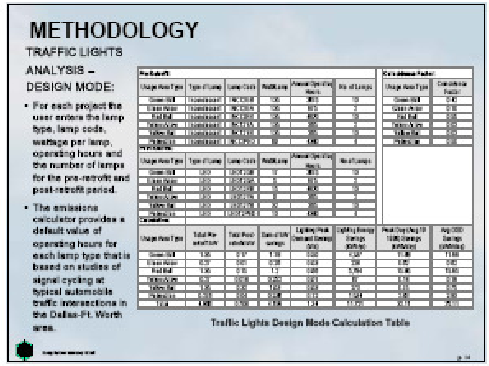
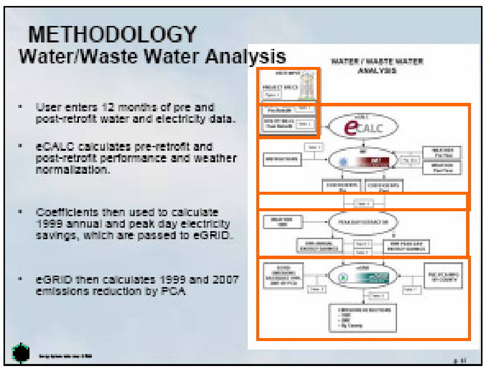
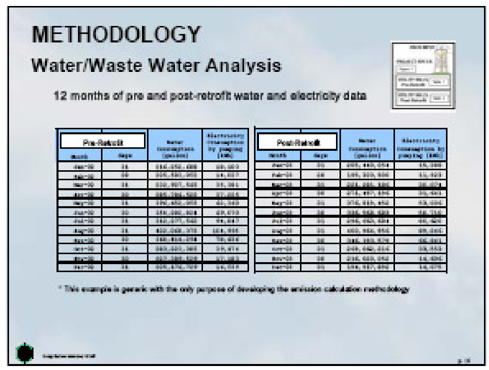


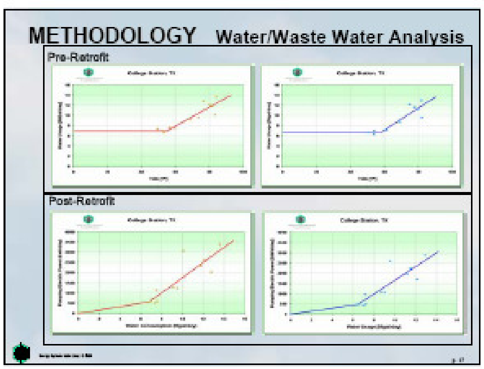
Figure 52: Slides presented at the EPRI Conference Call (April 2007).

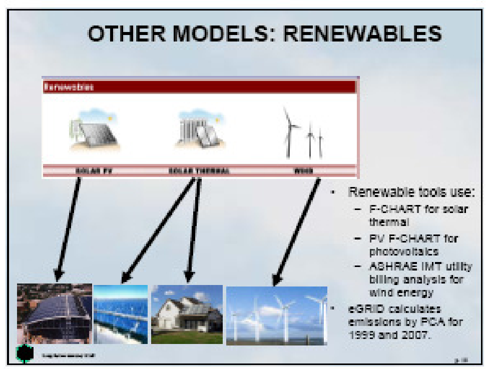


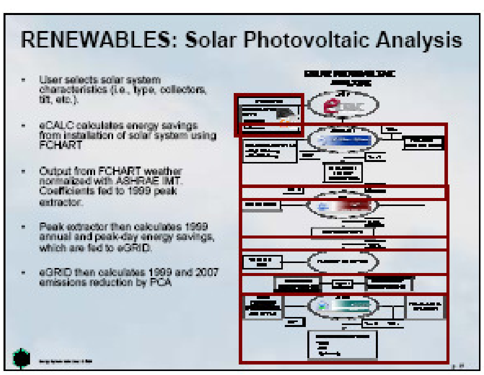












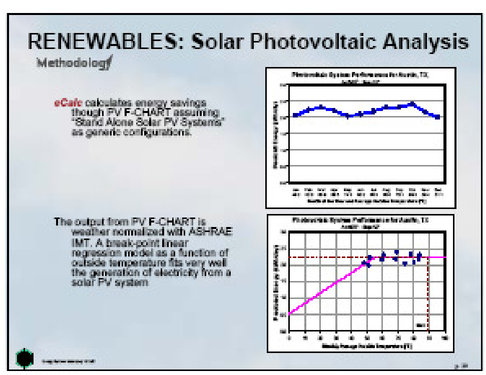
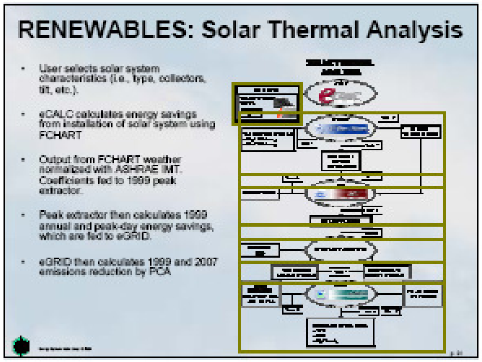
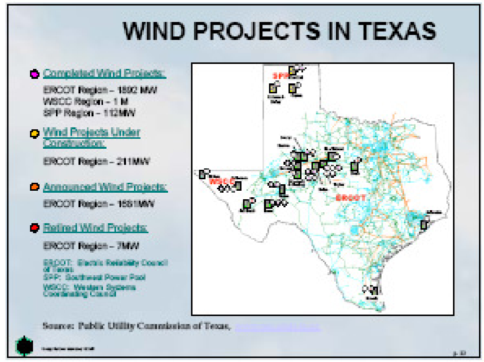
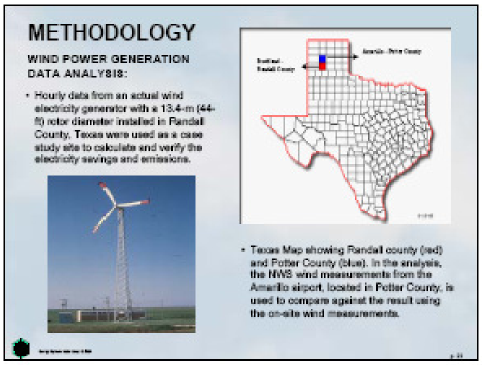
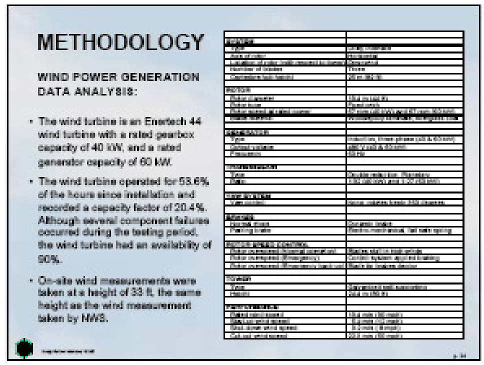


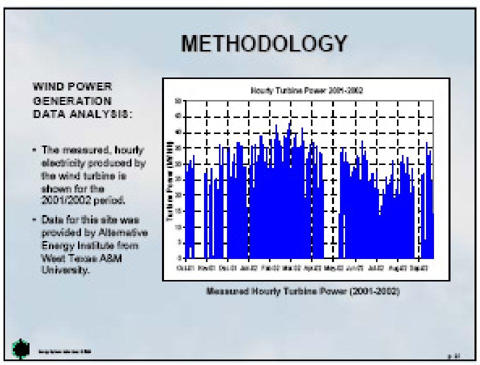
Figure 53: Slides presented at the EPRI Conference Call (April 2007).

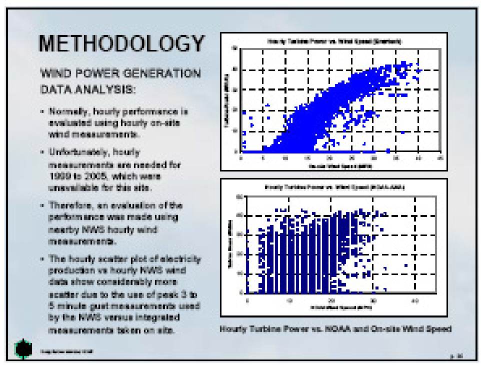


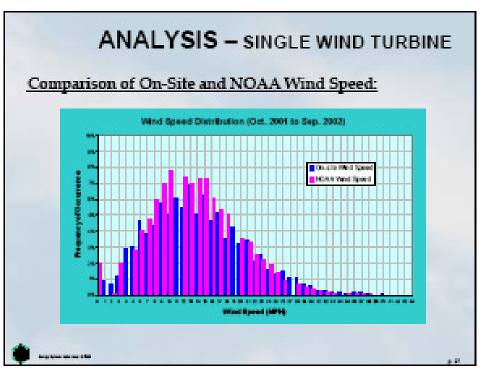












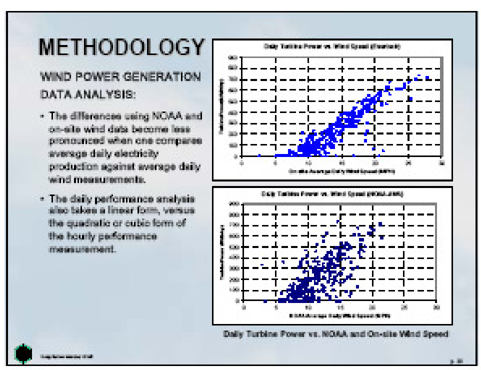
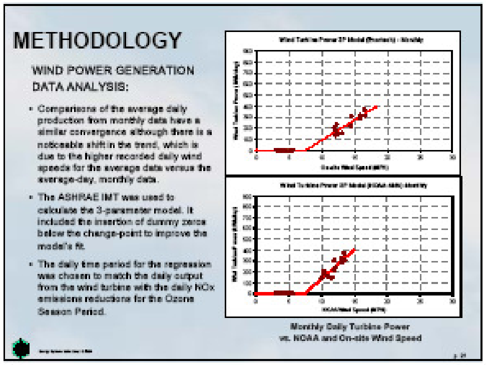
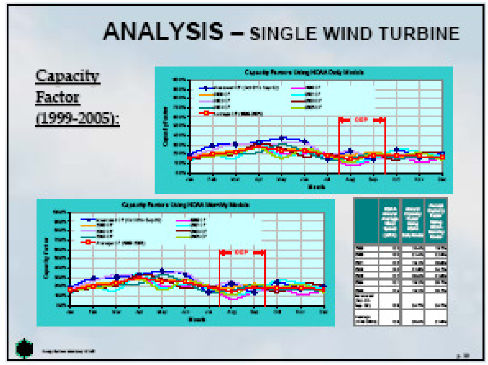
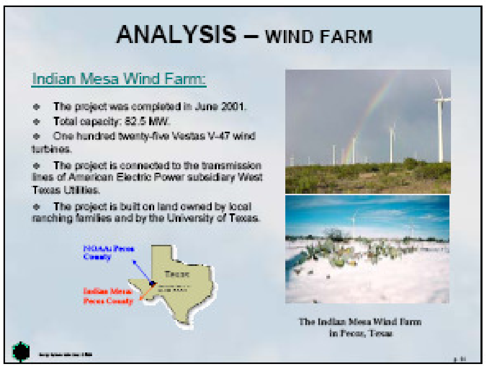
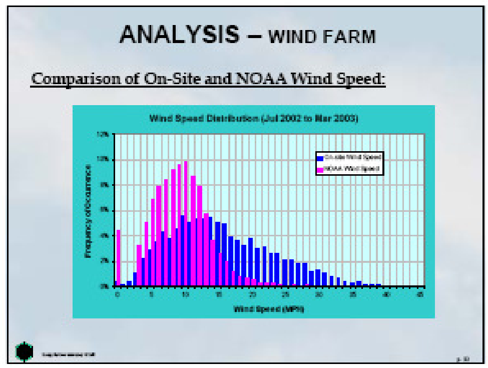


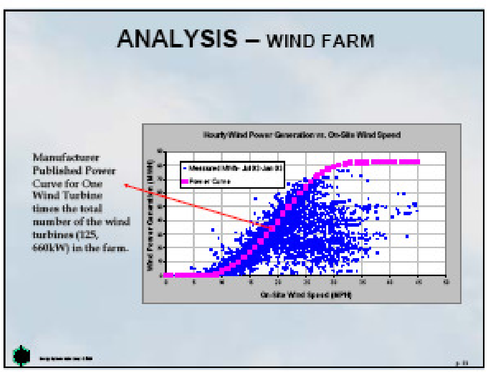
Figure 54: Slides presented at the EPRI Conference Call (April 2007).

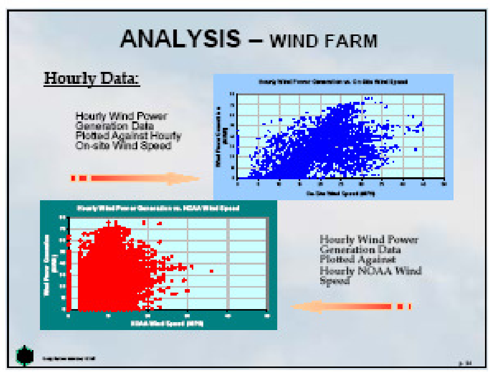


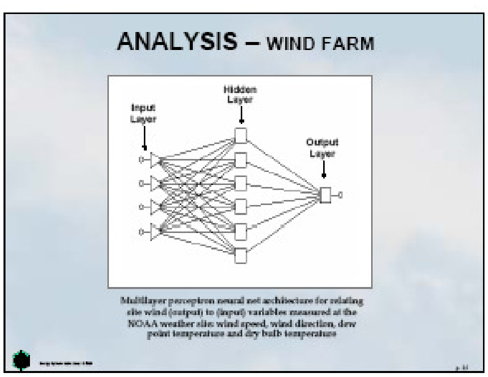












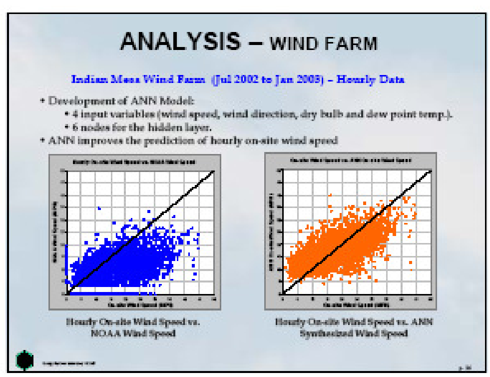
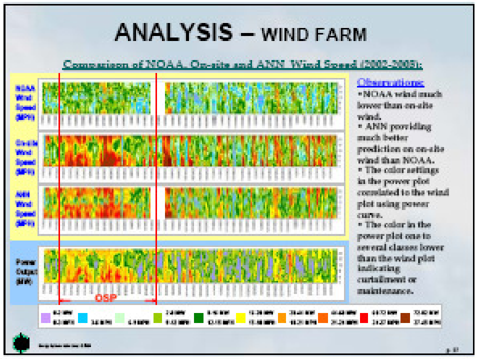
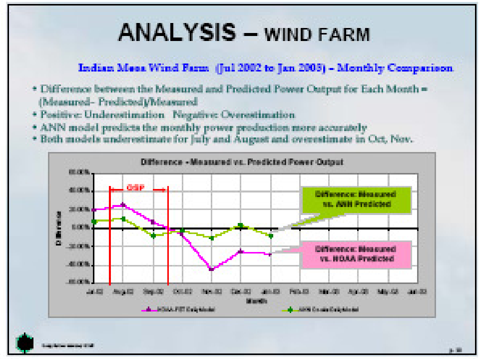
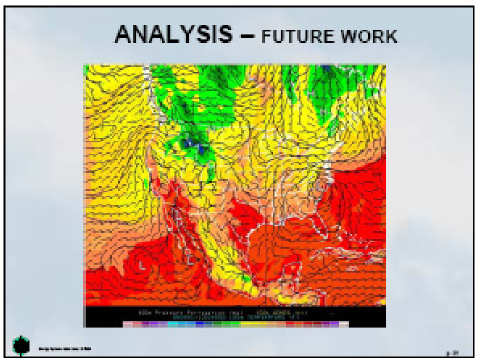
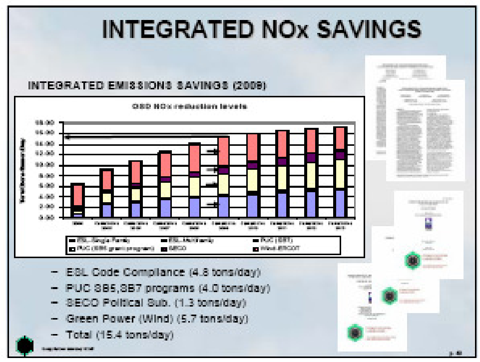


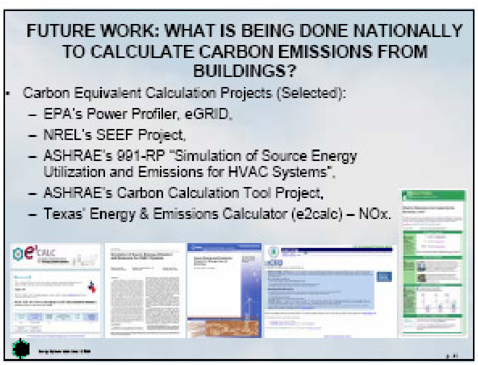
Figure 55: Slides presented at the EPRI Conference Call (April 2007).

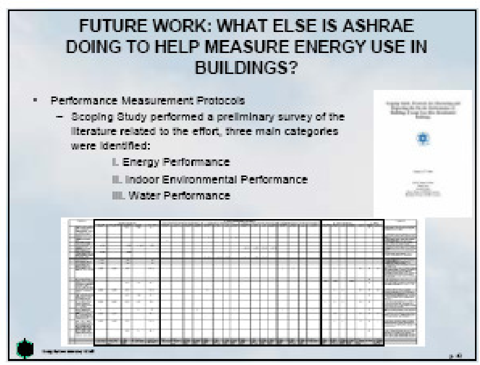


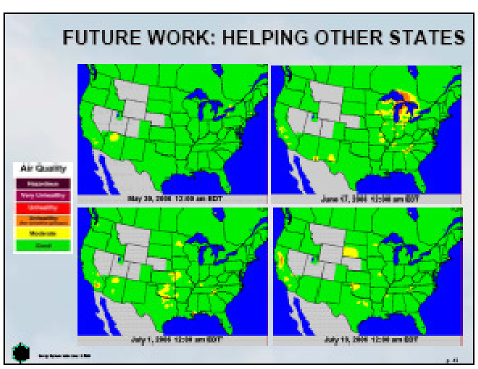












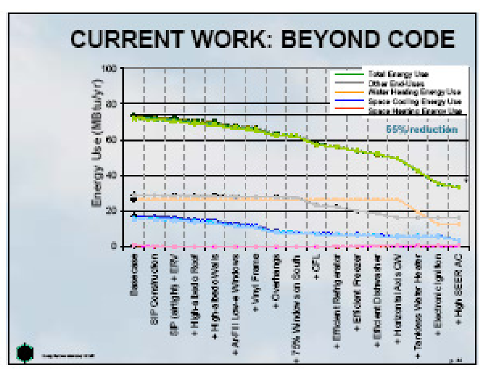
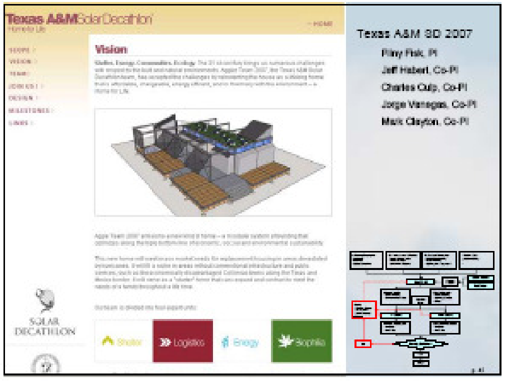


Figure 56: Slides presented at the EPRI Conference Call (April 2007).



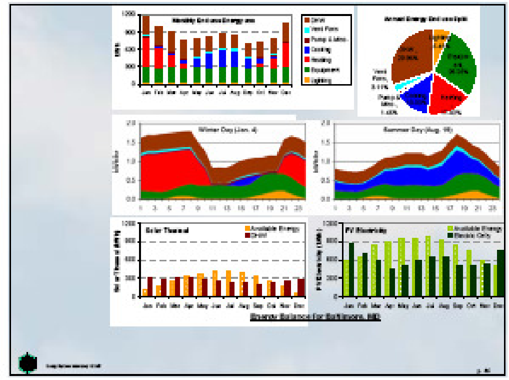
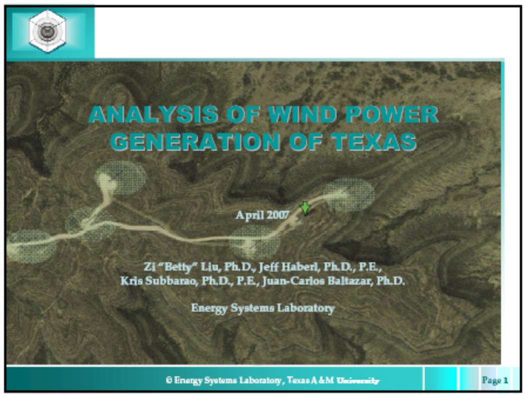
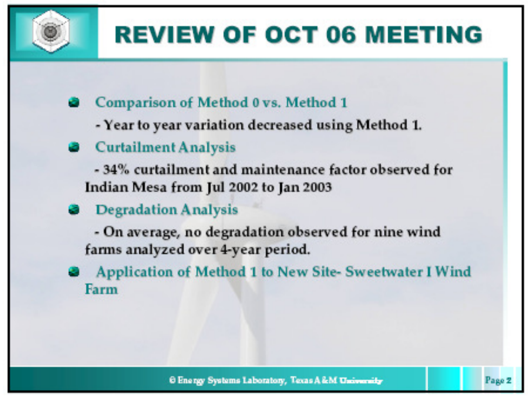


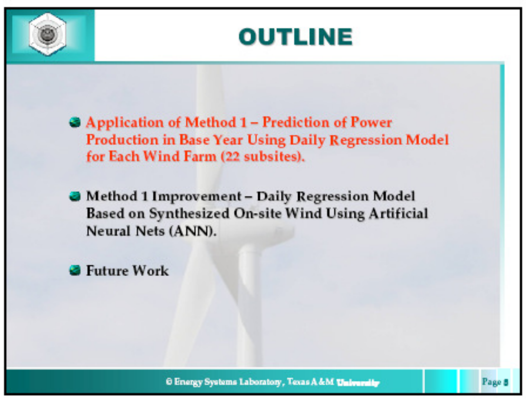
Figure 57: Slides presented at the EPRI Conference Call (April 2007).

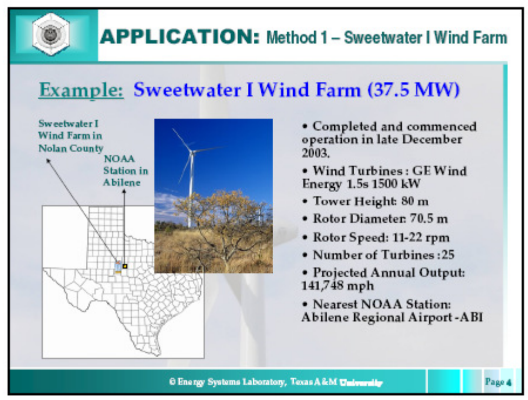
5.2.7.6 Presentation at Wind Stakeholders Conference Call, April 2007 (by phone).

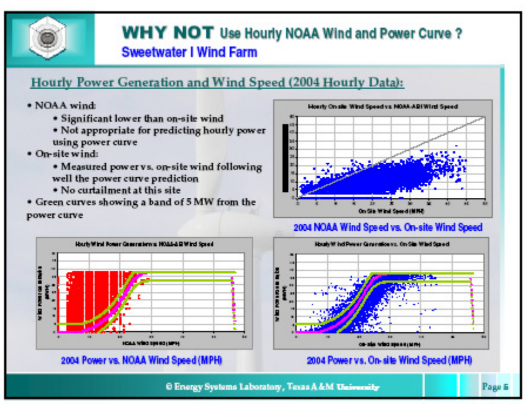
In April of 2007, the Laboratory held a conference call with the wind energy stakeholders, where information was presented regarding the progress the Laboratory had made in modeling hourly wind speed.











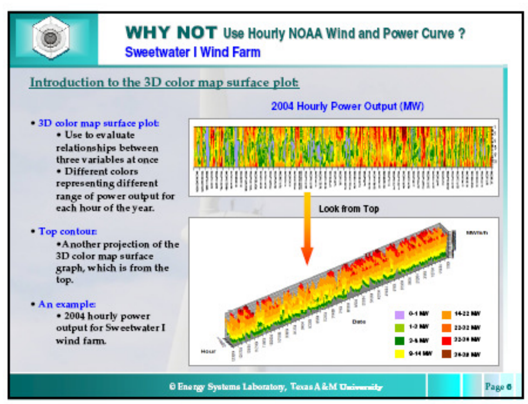
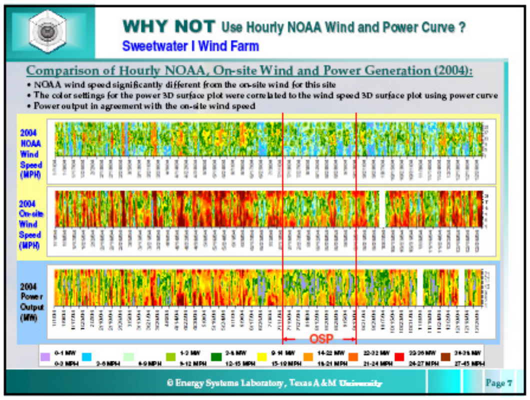
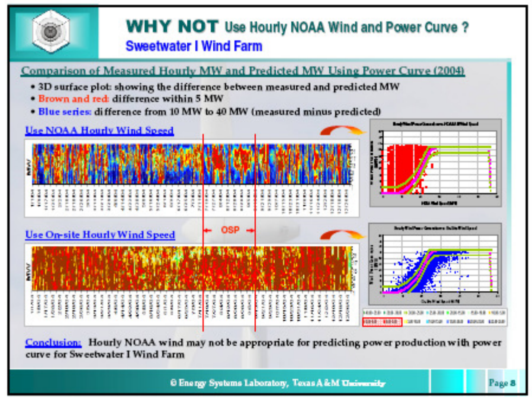
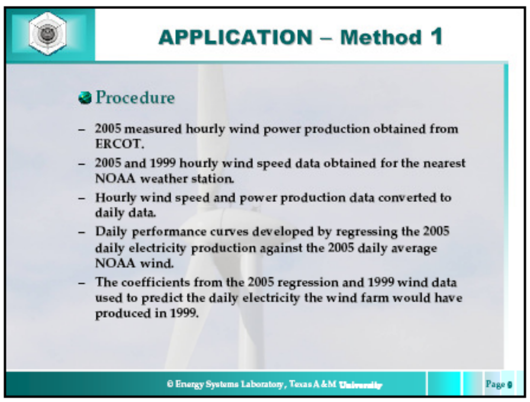
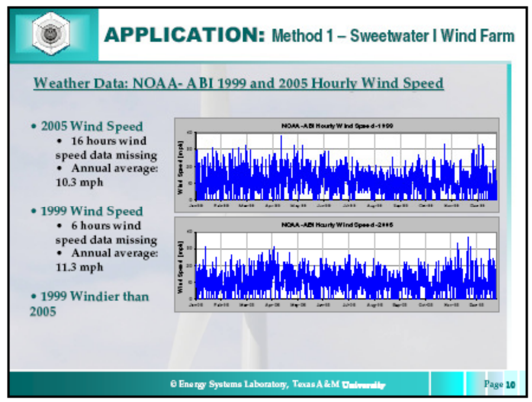


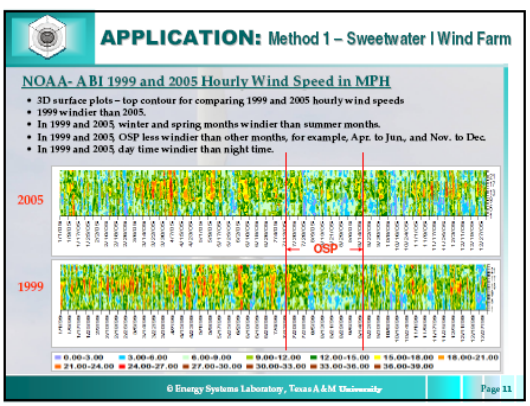
Figure 58: Slides presented at the Wind Stakeholders Conference Call (April 2007).











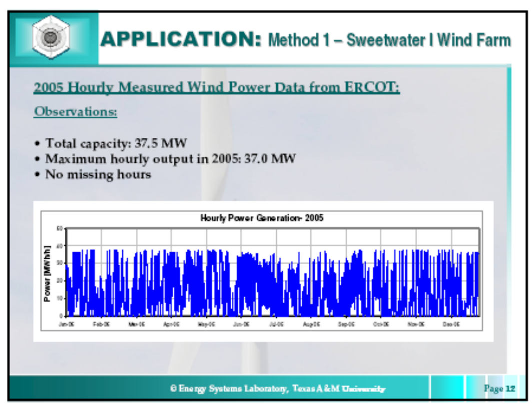
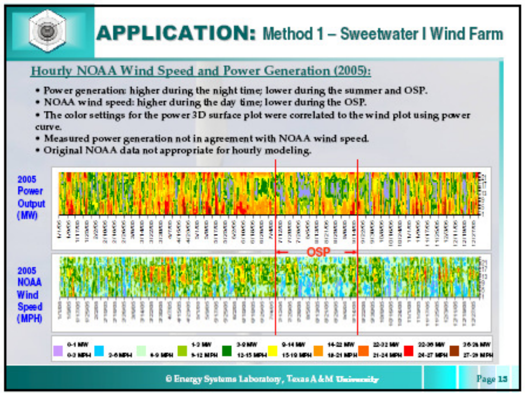
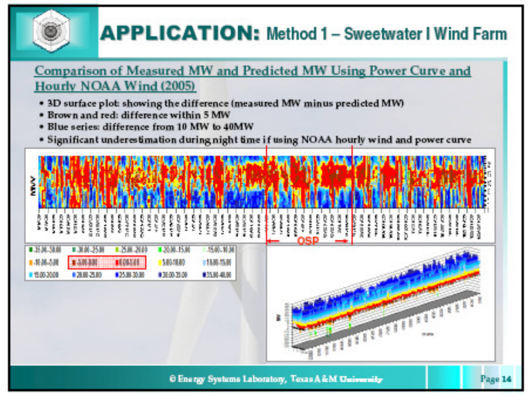
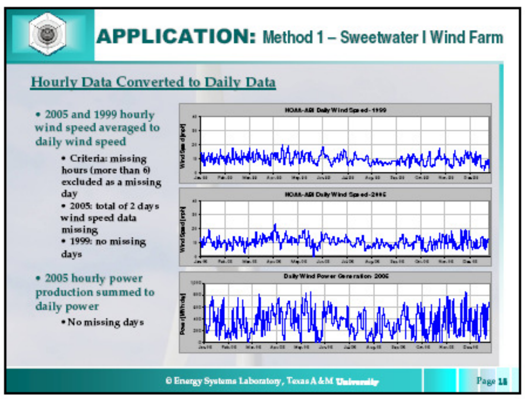
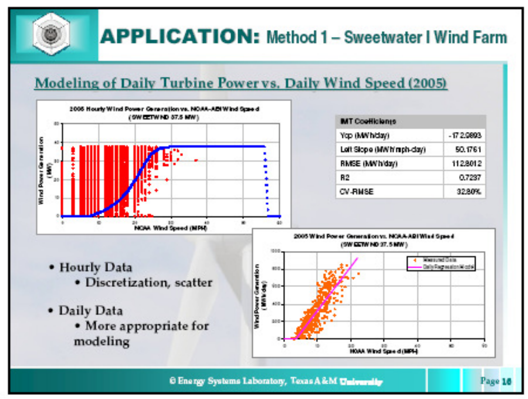


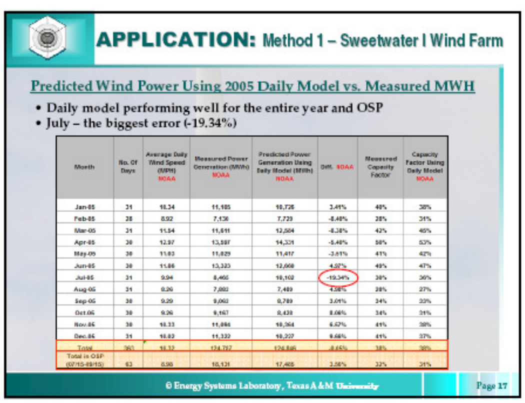
Figure 59: Slides presented at the Wind Stakeholders Conference Call (April 2007).











Month	No. Of Days	Average Daily Wind Speed (MPH) NOAA	Measured Power Generation (MWh) NOAA	Predicted Power Generation Using Daily Model (MWh) NOAA	Diff. NOAA	Measured Capacity Factor	Capacity Factor Using Daily Model NOAA
Jan-05	31	10.34	11,105	10,726	3.41%	40%	38%
Feb-05	28	8.92	7,130	7,729	-8.40%	28%	31%
Mar-05	31	11.54	11,611	12,584	-8.38%	42%	45%
Apr-05	30	12.97	13,587	14,331	-5.40%	50%	53%
May-05	30	11.03	11,029	11,417	-3.61%	41%	42%
Jun-05	30	11.86	13,325	12,660	4.97%	49%	47%
Jul-05	31	9.94	8,465	10,102	-19.34%	30%	36%
Aug-05	31	8.26	7,083	7,489	4.98%	28%	27%
Sep-05	30	9.29	9,062	8,789	3.01%	34%	33%
Oct-05	30	9.26	9,167	8,438	8.06%	34%	31%
Nov-05	30	10.33	11,086	10,364	6.67%	41%	38%
Dec-05	31	10.83	11,332	10,227	9.66%	41%	37%
Total	363	10.32	124,797	124,846	-0.65%	38%	38%
Total in OSP (07/15-09/15)	63	8.98	16,131	17,465	3.58%	32%	31%

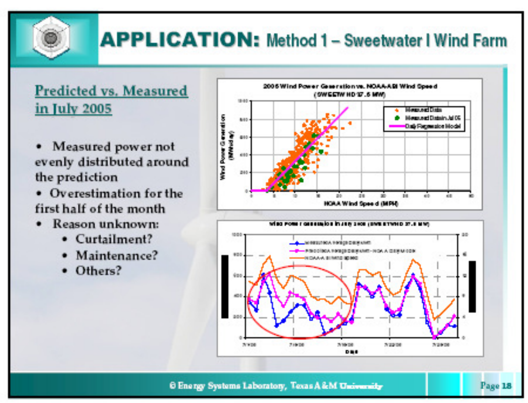
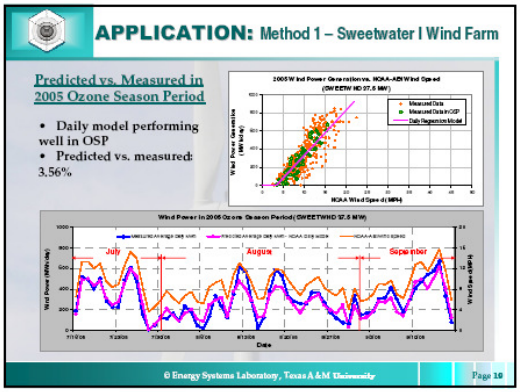
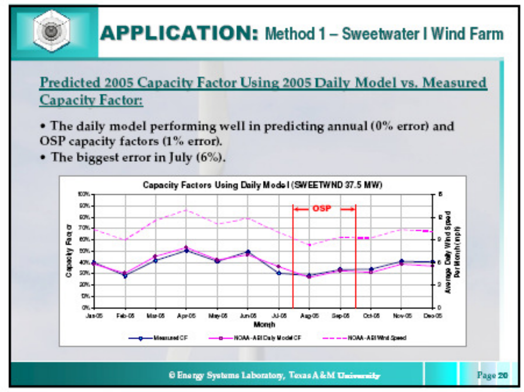
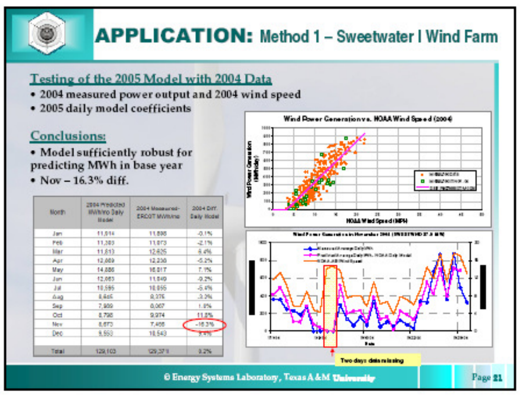
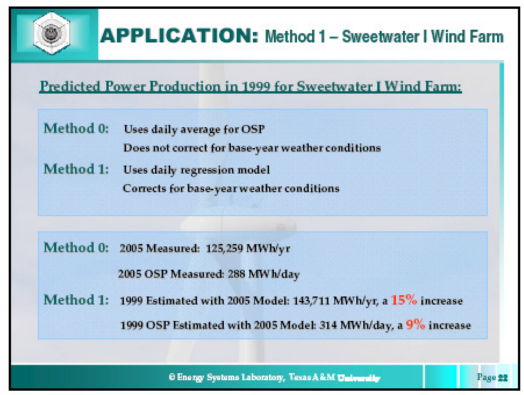


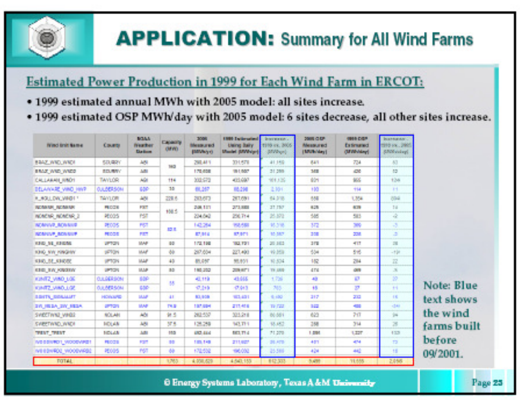
Figure 60: Slides presented at the Wind Stakeholders Conference Call (April 2007).











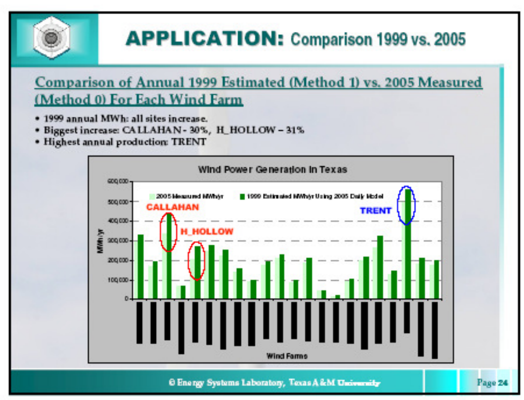
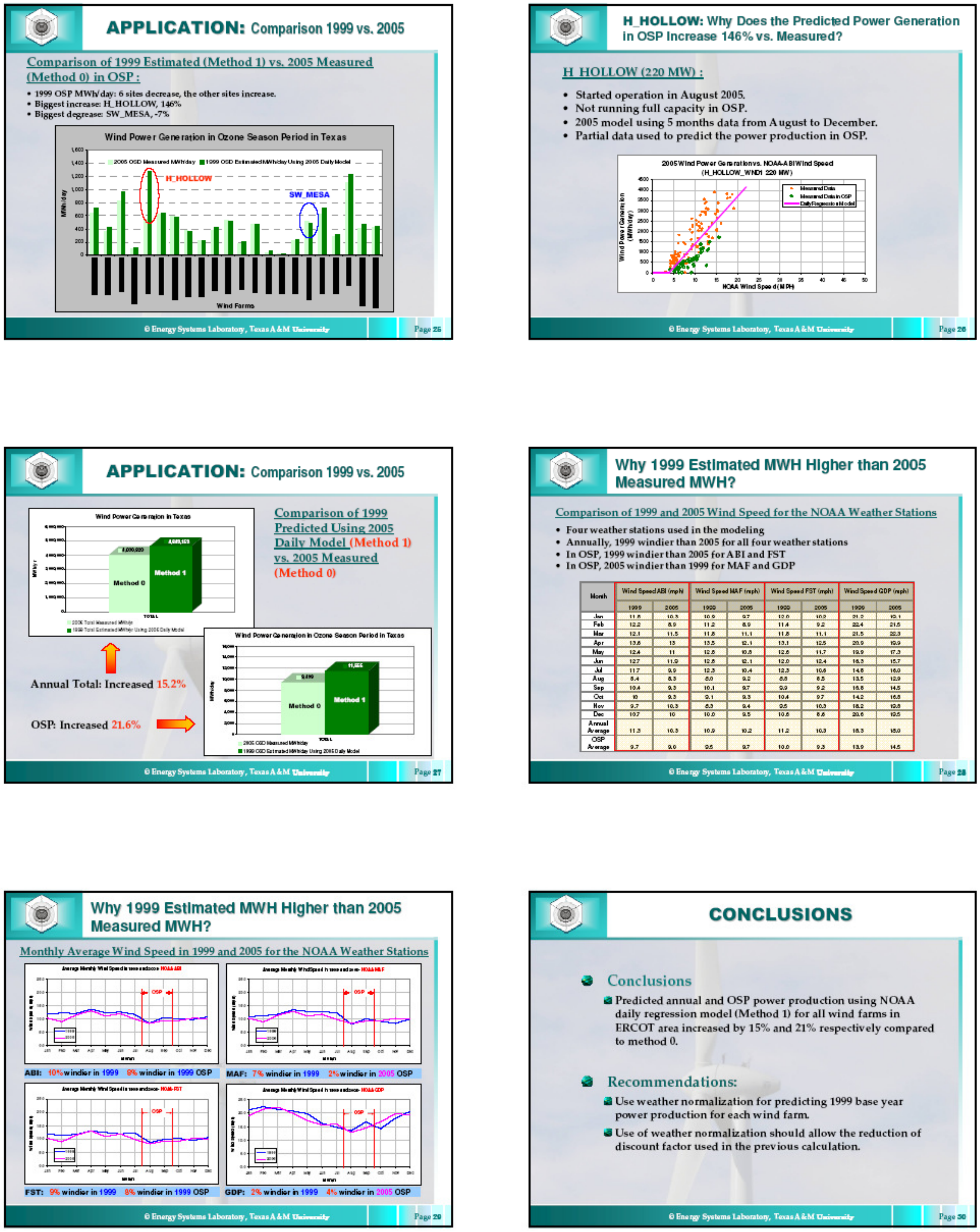
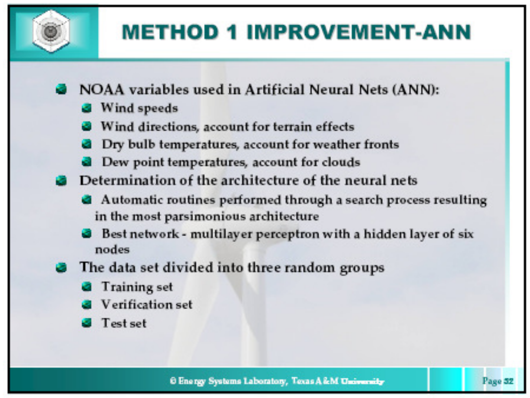


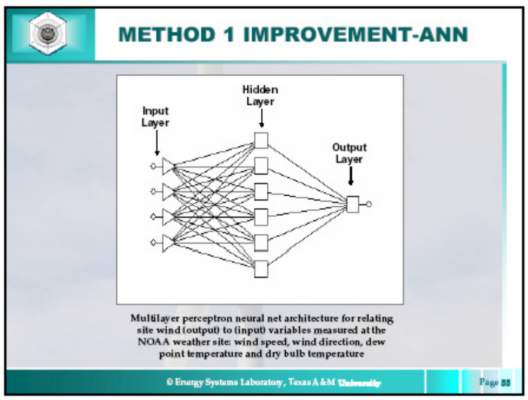
Figure 61: Slides presented at the Wind Stakeholders Conference Call (April 2007).

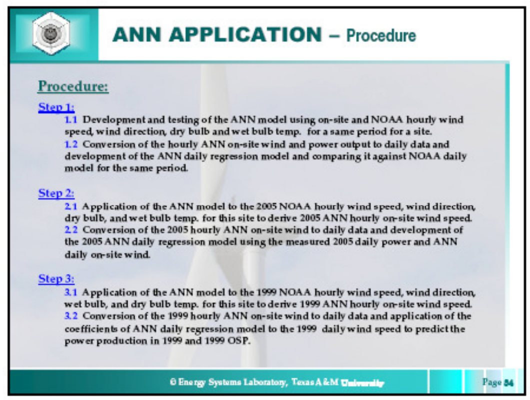


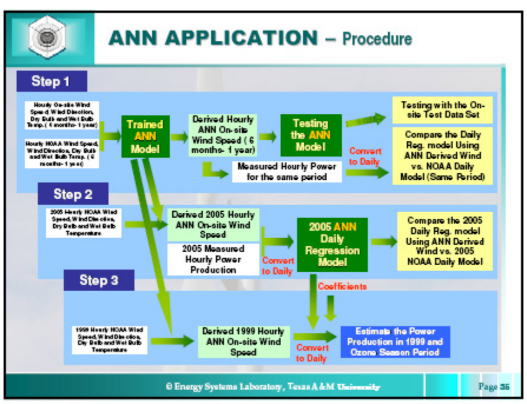
Month	Wind Speed ABI (mph)		Wind Speed MAF (mph)		Wind Speed FST (mph)		Wind Speed GDP (mph)	
	1999	2005	1999	2005	1999	2005	1999	2005
Jan	11.8	10.3	10.9	9.7	12.0	10.2	21.2	19.1
Feb	12.2	8.9	11.2	8.9	11.4	9.2	22.4	21.5
Mar	12.1	11.5	11.8	11.1	11.8	11.1	21.5	22.3
Apr	13.6	13	13.5	12.1	13.1	12.5	20.9	19.9
May	12.4	11	12.8	10.8	12.6	11.7	19.9	17.3
Jun	12.7	11.9	12.8	12.1	12.0	12.4	18.3	15.7
Jul	11.7	9.9	12.3	10.4	12.3	10.8	14.8	16.0
Aug	8.4	8.3	8.0	9.2	8.8	8.5	13.5	12.9
Sep	10.4	9.3	10.1	9.7	9.9	9.2	16.8	14.5
Oct	10	9.3	9.1	9.3	10.4	9.7	14.2	16.8
Nov	9.7	10.3	8.3	9.4	9.5	10.3	18.2	19.8
Dec	10.7	10	10.0	9.5	10.6	8.8	20.6	19.5
Annual Average	11.3	10.3	10.9	10.2	11.2	10.3	18.3	18.0
OSP Average	9.7	9.0	9.5	9.7	10.0	9.3	13.9	14.5

Figure 62: Slides presented at the Wind Stakeholders Conference Call (April 2007).









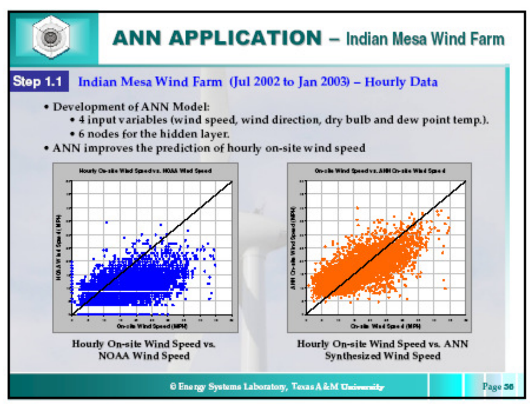
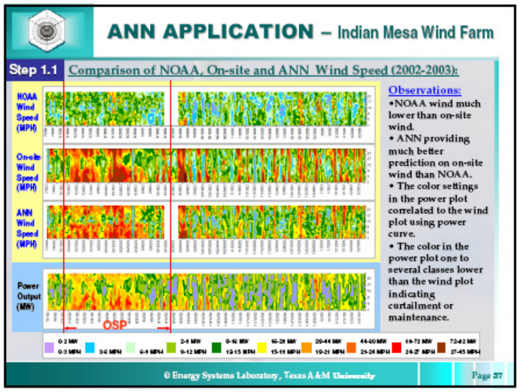
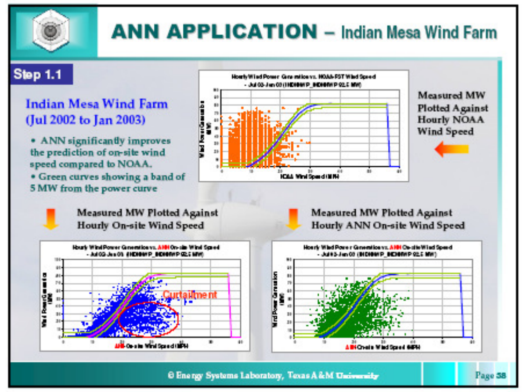
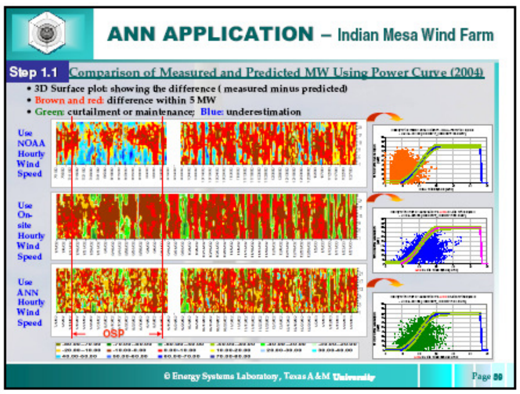
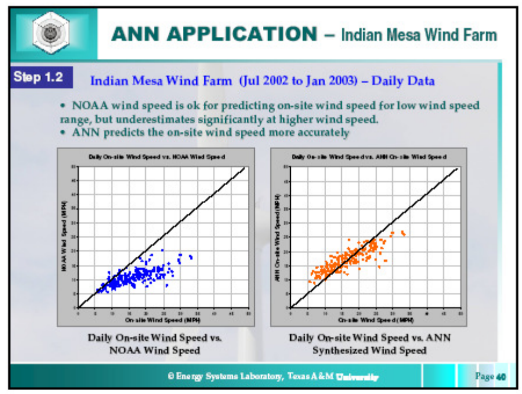


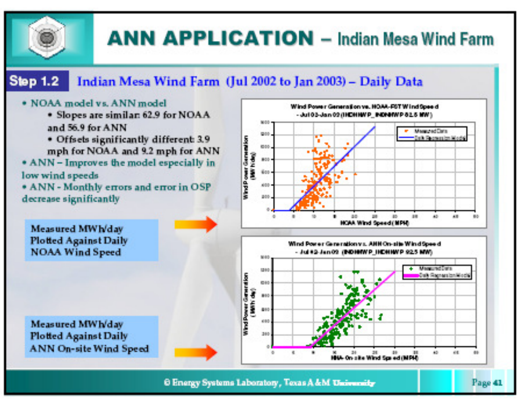
Figure 63: Slides presented at the Wind Stakeholders Conference Call (April 2007).











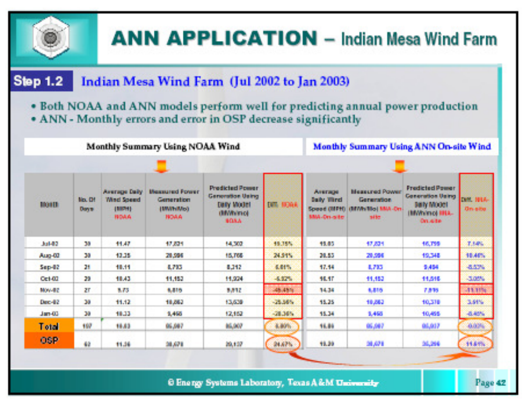
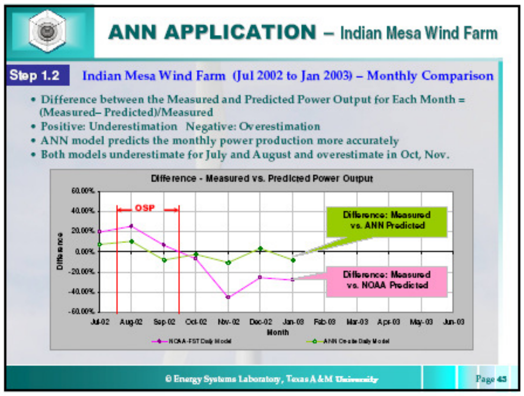
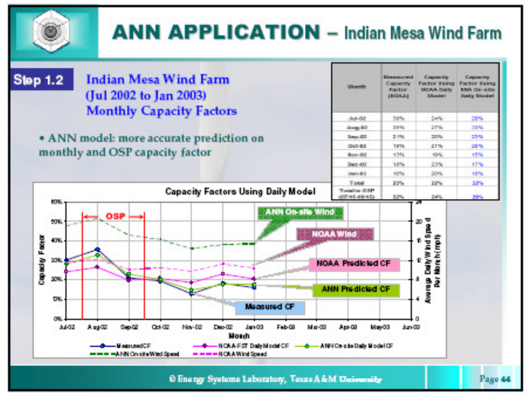
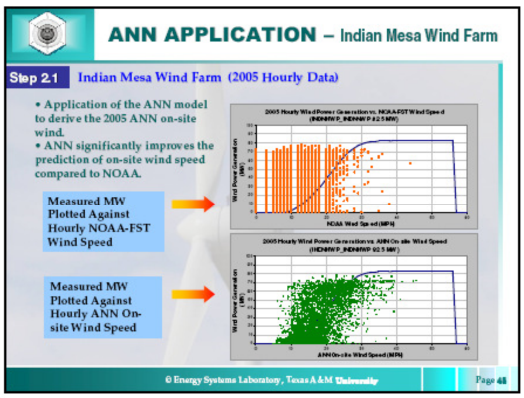
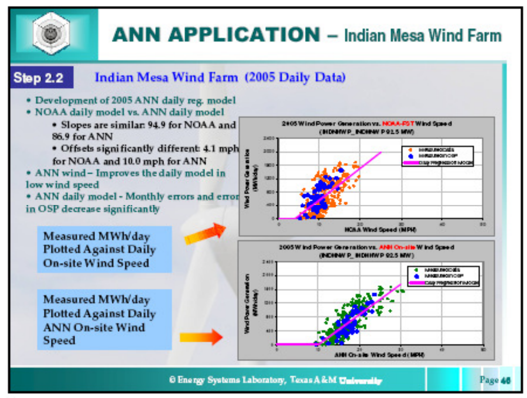


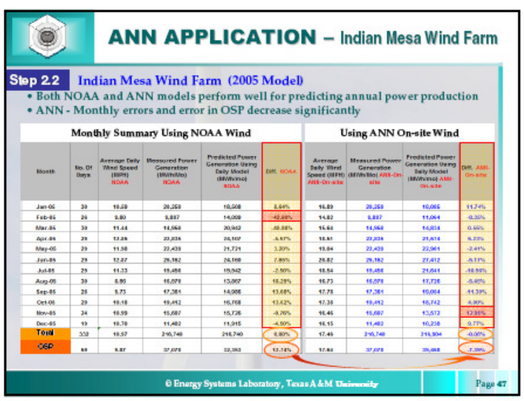
Figure 64: Slides presented at the Wind Stakeholders Conference Call (April 2007).











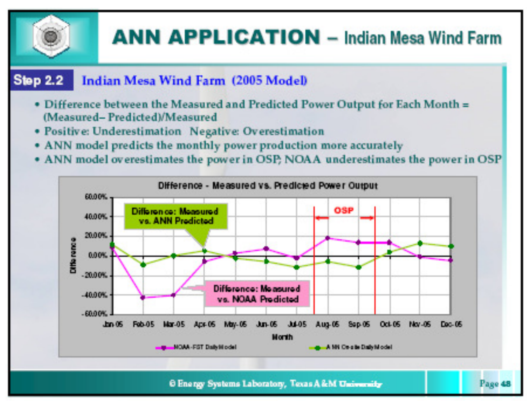
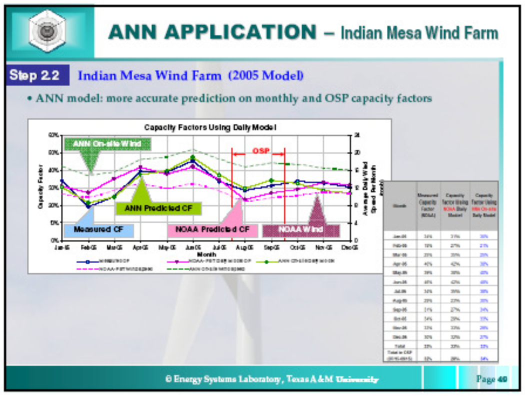
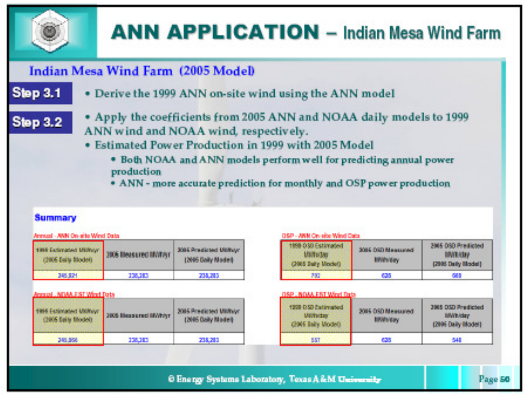
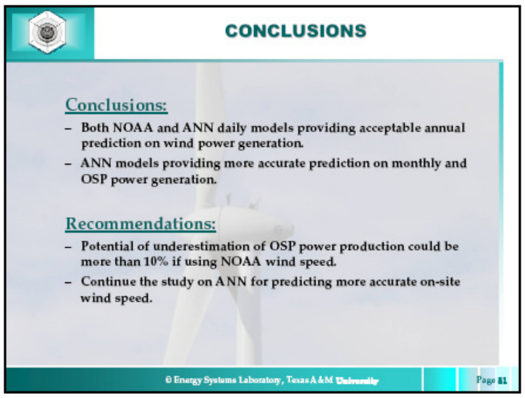


Figure 65: Slides presented at the Wind Stakeholders Conference Call (April 2007).







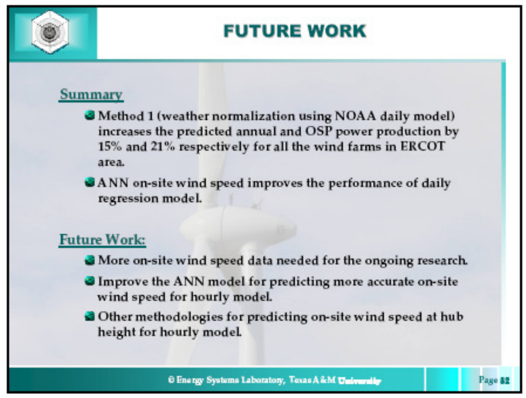
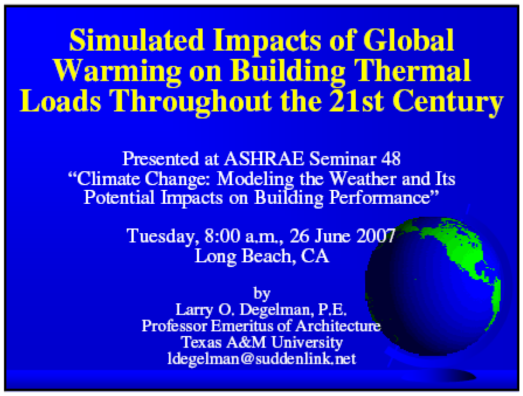
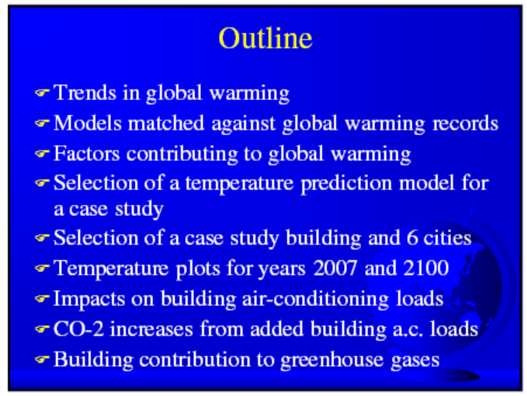


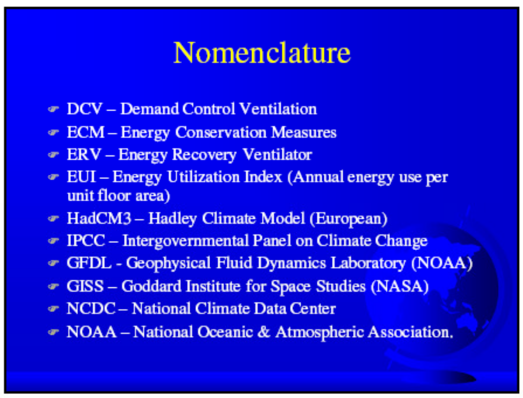
Figure 66: Slides presented at the Wind Stakeholders Conference Call (April 2007).

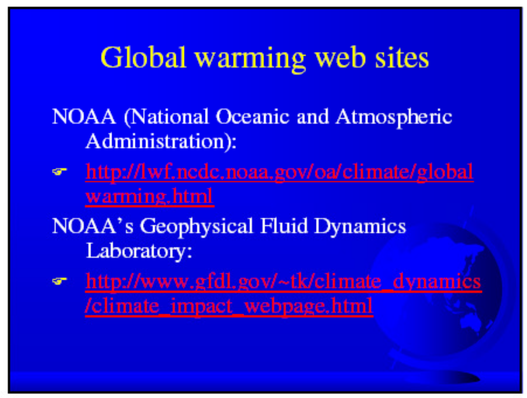
5.2.7.7 Presentation at the ASHRAE Conference in Long Beach, California, June 2007.

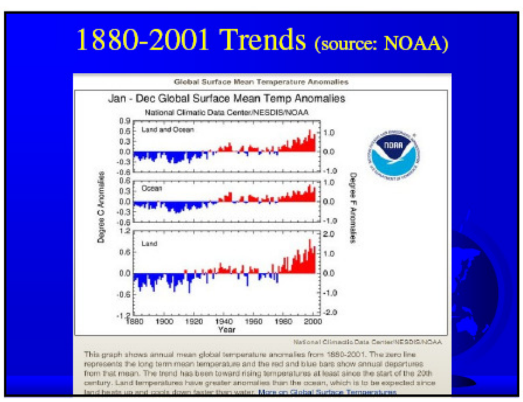
In June 2007, the Laboratory delivered a presentation on the impact of global warming on building energy use, which included a typical building in Houston, Texas. The following figures present the slides used in this presentation.











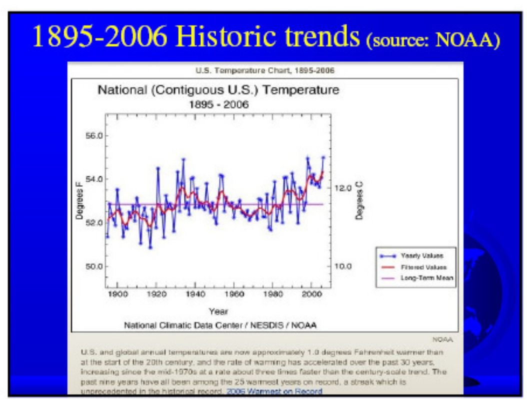
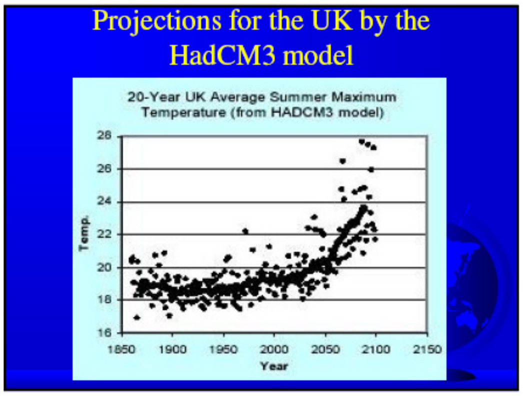
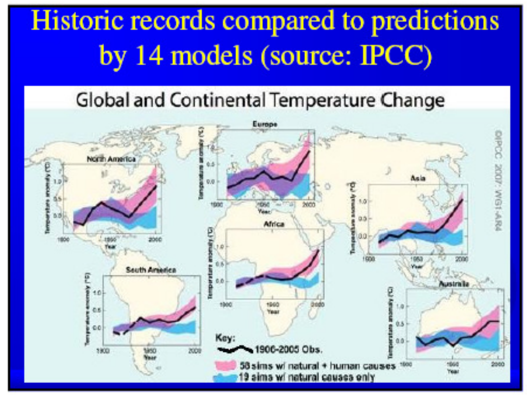
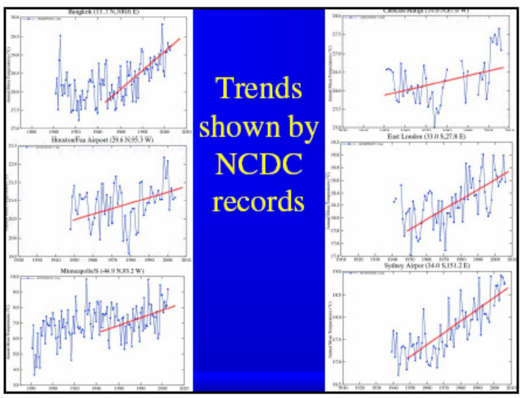
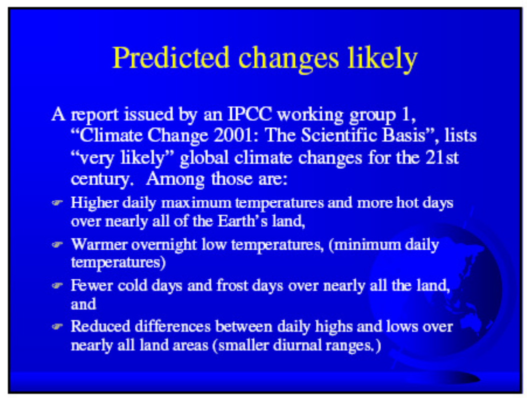


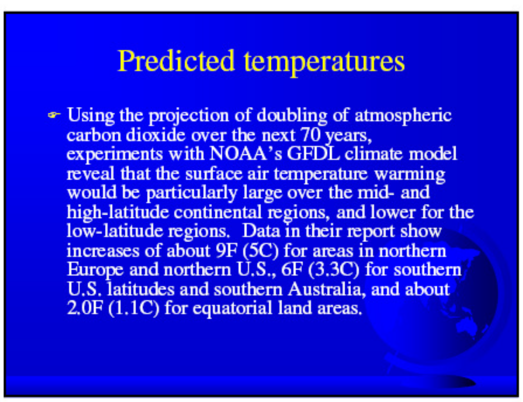
Figure 67: Slides presented at the ASHRAE Conference, Long Beach, CA (June 2007).











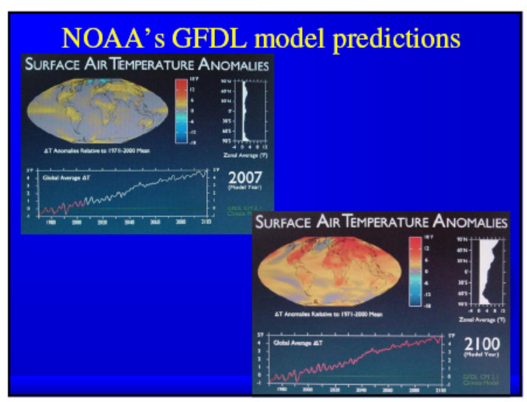
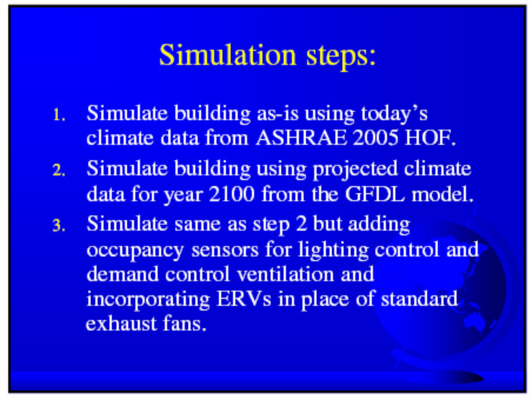
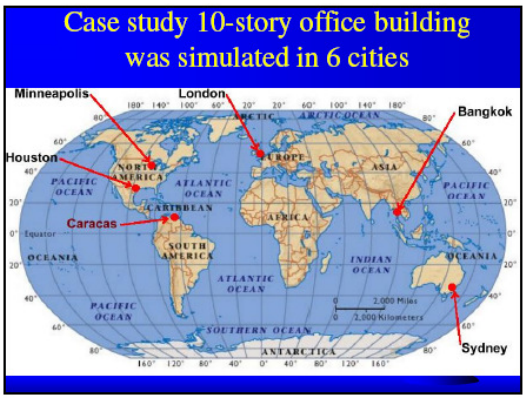
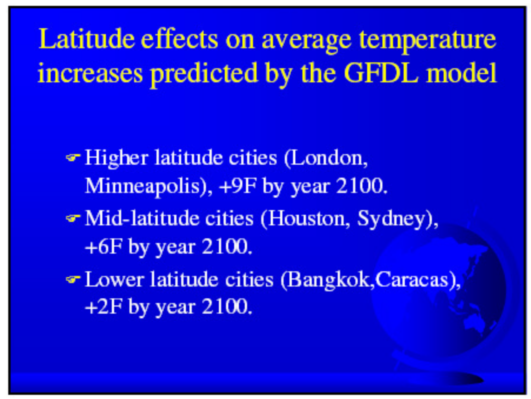
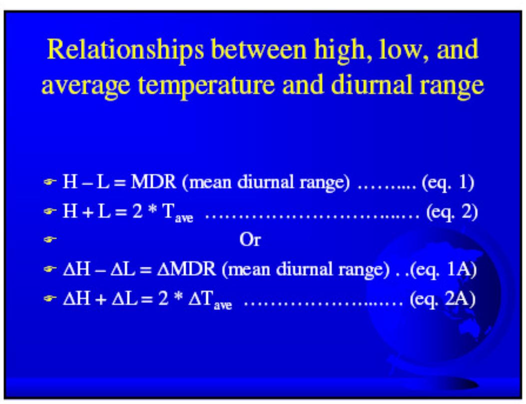


Figure 68: Slides presented at the ASHRAE Conference, Long Beach, CA (June 2007).









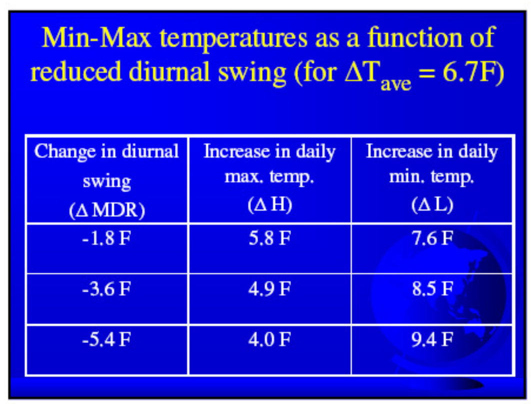
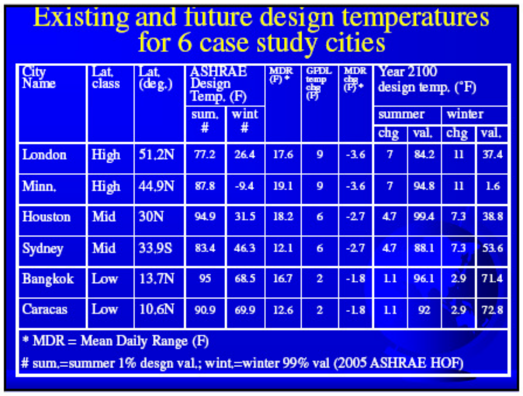


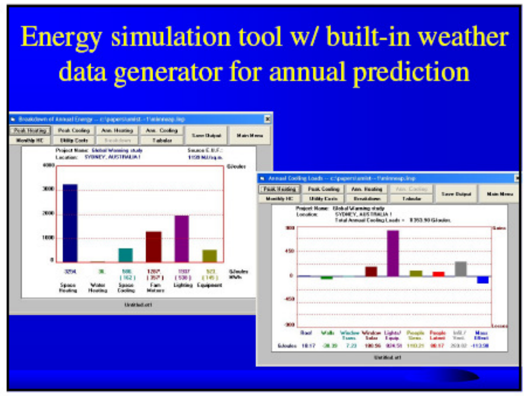
Figure 69: Slides presented at the ASHRAE Conference, Long Beach, CA (June 2007).

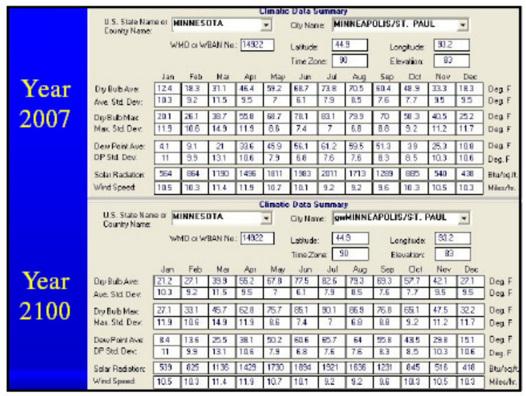


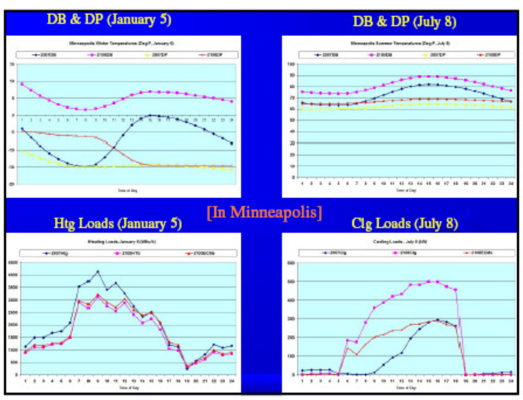
Existing and future design temperatures for 6 case study cities

City Name	Lat. class	Lat. (deg.)	ASHRAE Design Temp. (F)		MDR (F) *	GFDL temp chg (F)	MDR chg (F) *	Year 2100 design temp. (°F)			
			sum. #	wint #				summer		winter	
								chg	val.	chg	val.
London	High	51.2N	77.2	26.4	17.6	9	-3.6	7	84.2	11	37.4
Minn.	High	44.9N	87.8	-9.4	19.1	9	-3.6	7	94.8	11	1.6
Houston	Mid	30N	94.9	31.5	18.2	6	-2.7	4.7	99.4	7.3	38.8
Sydney	Mid	33.9S	83.4	46.3	12.1	6	-2.7	4.7	88.1	7.3	53.6
Bangkok	Low	13.7N	95	68.5	16.7	2	-1.8	1.1	96.1	2.9	71.4
Caracas	Low	10.6N	90.9	69.9	12.6	2	-1.8	1.1	92	2.9	72.8

* MDR = Mean Daily Range (F)
# sum.=summer 1% desgn val.; wint.=winter 99% val (2005 ASHRAE HOF)







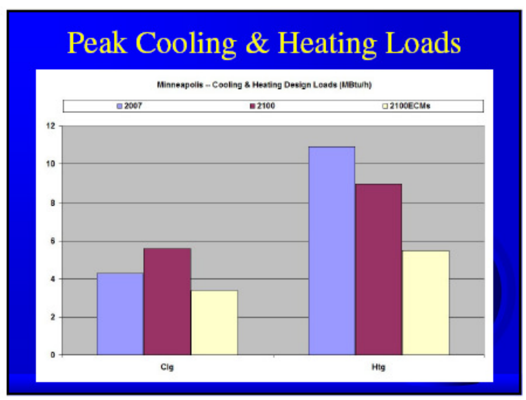


Figure 70: Slides presented at the ASHRAE Conference, Long Beach, CA (June 2007).

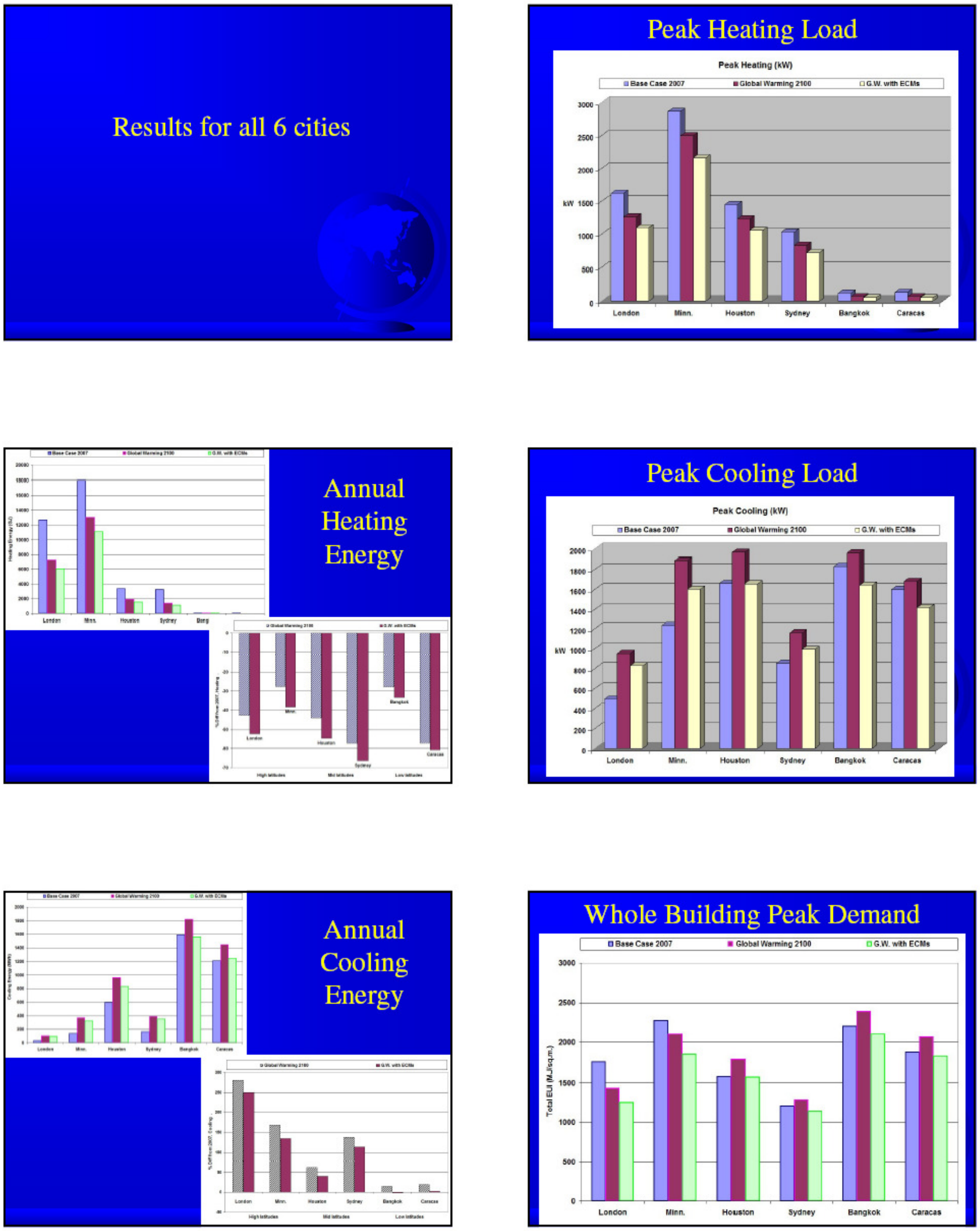
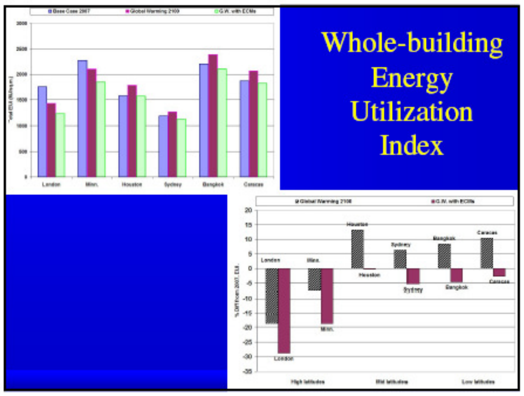
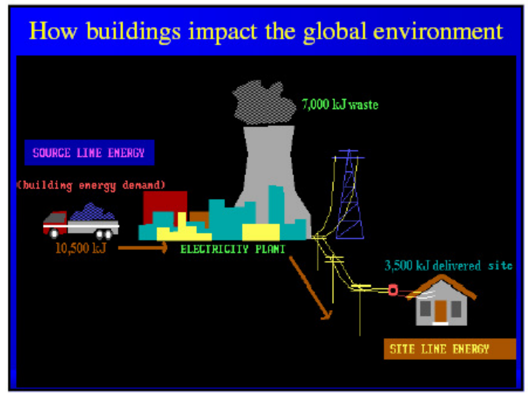
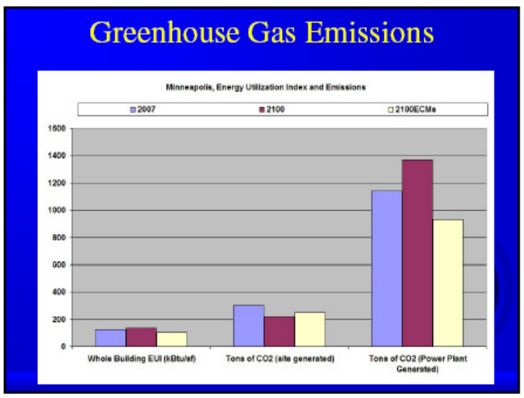
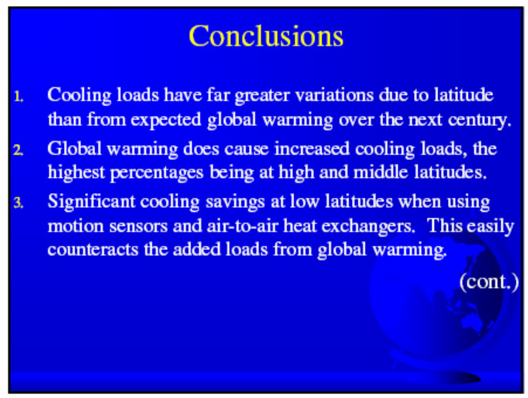


Figure 71: Slides presented at the ASHRAE Conference, Long Beach, CA (June 2007).









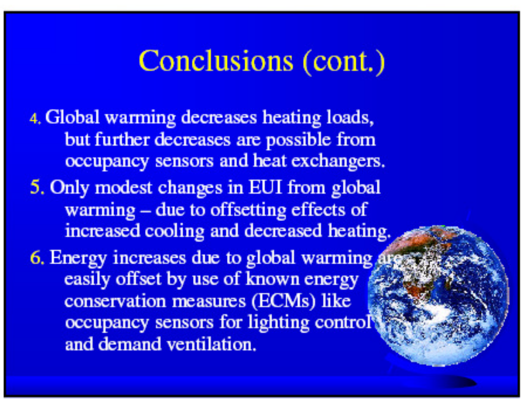
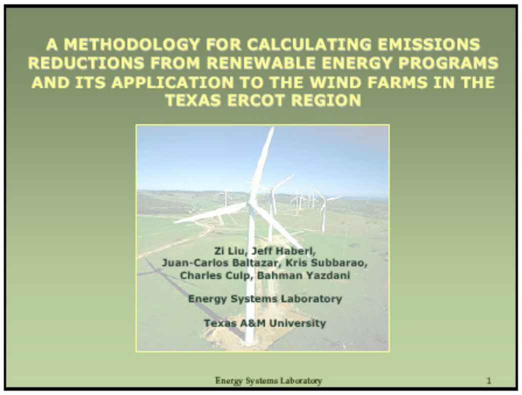
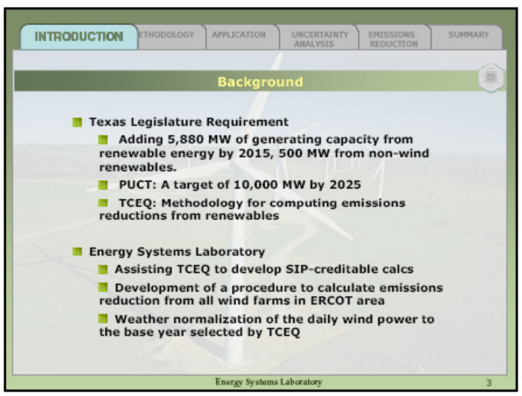


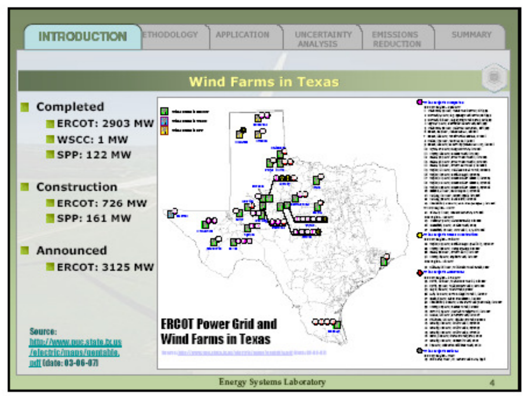
Figure 72: Slides presented at the ASHRAE Conference, Long Beach, CA (June 2007).

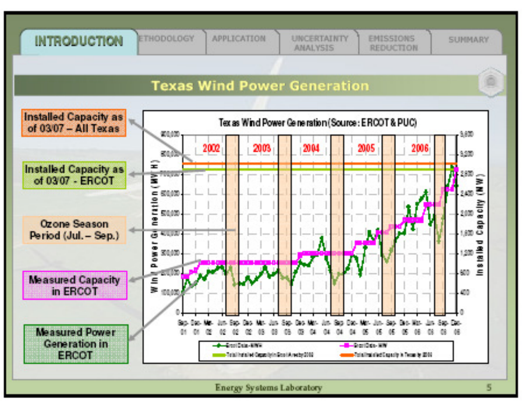
5.2.7.8 Presentation About Wind Calculations at the ICEBO Conference, San Francisco, CA, October 2007.

In October 2007, the Laboratory presented a paper at the ICEBO Conference in San Francisco, CA on the calculation of emissions reductions from electricity generated by wind energy.









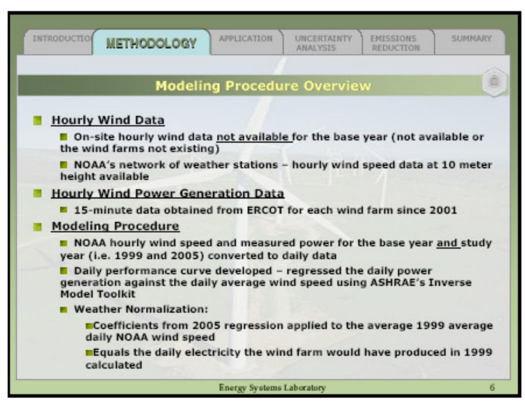
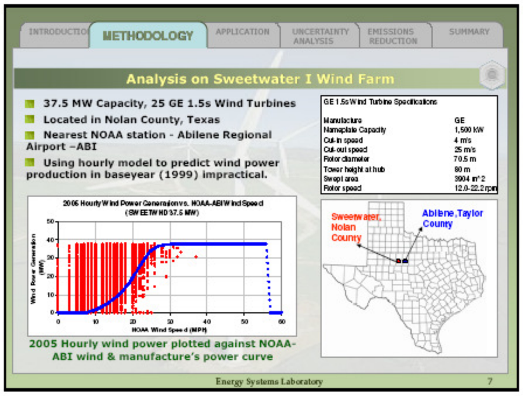
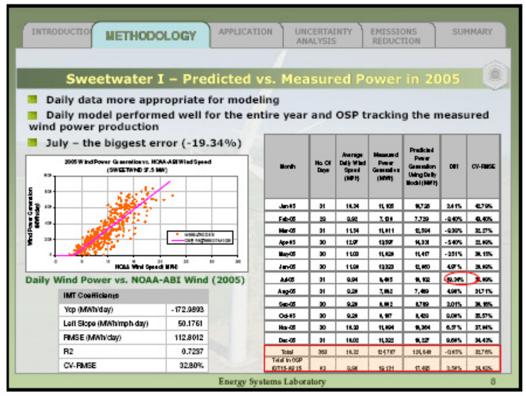
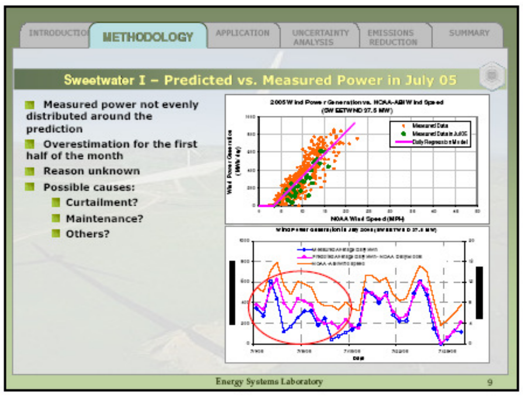
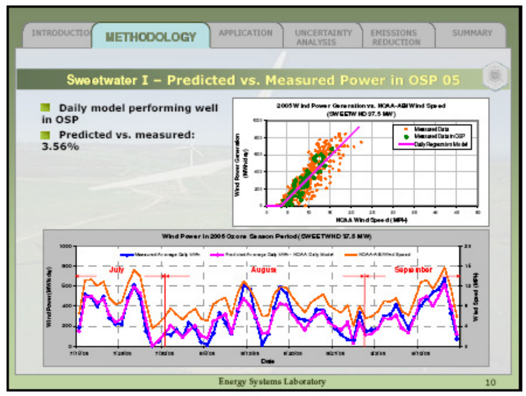


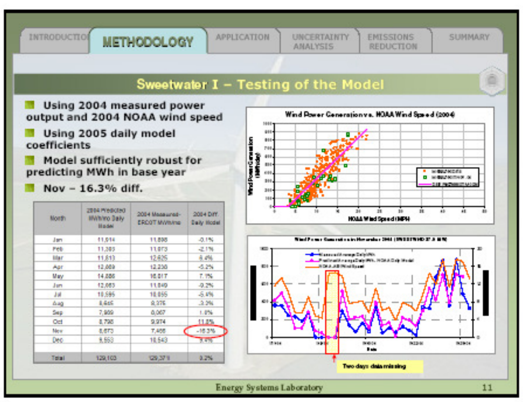
Figure 73: Slides presented at the ICEBO Conference about wind calculations, San Francisco, CA (October 2007).











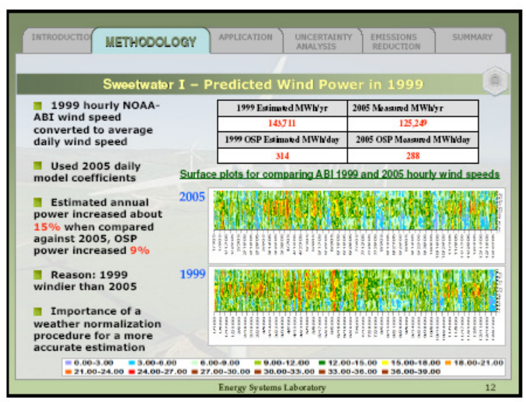
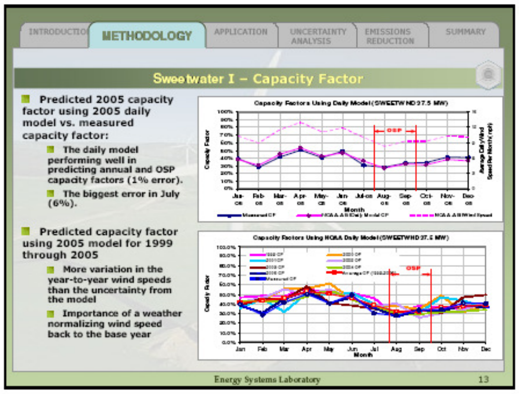
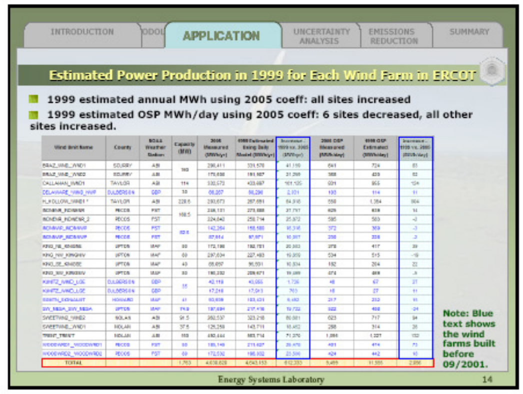
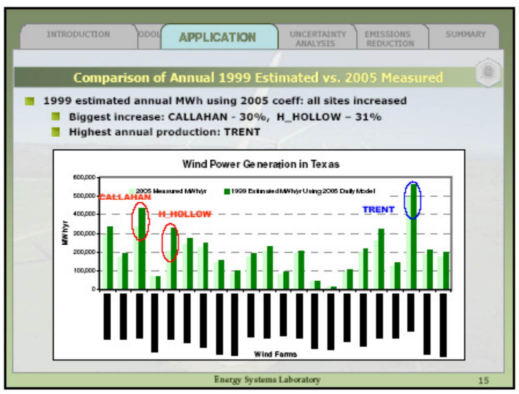
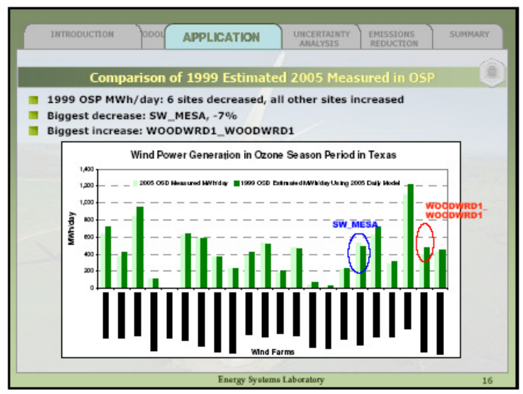


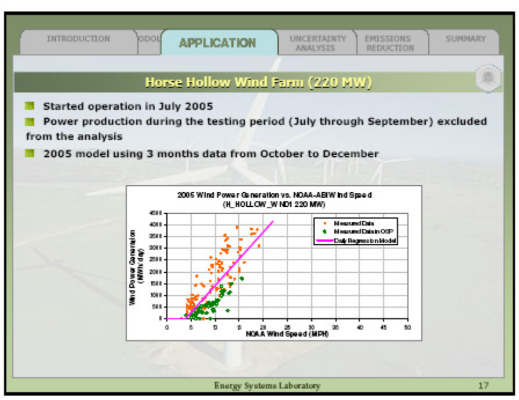
Figure 74: Slides presented at the ICEBO Conference about wind calculations, San Francisco, CA (October 2007).











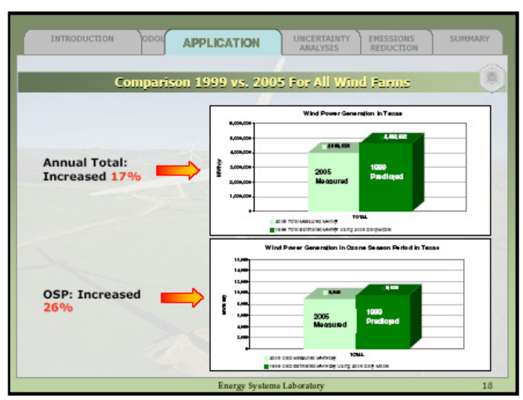
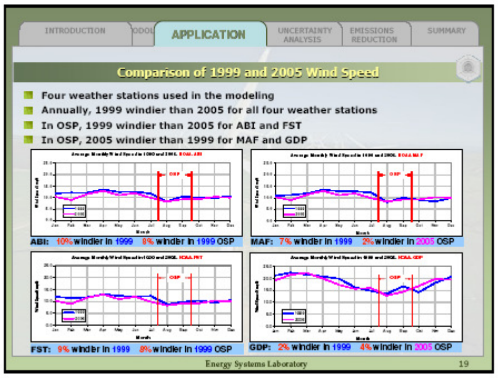
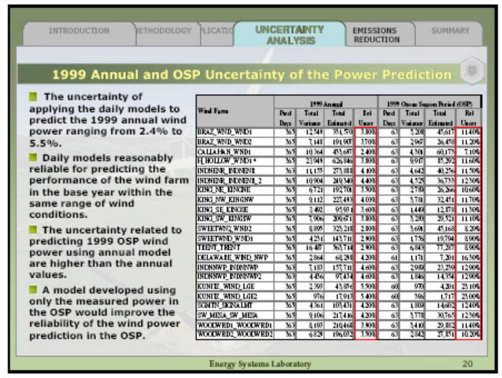
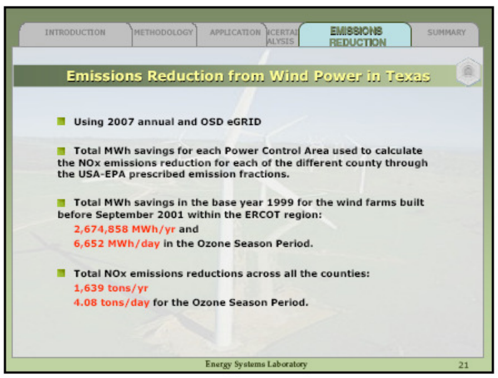
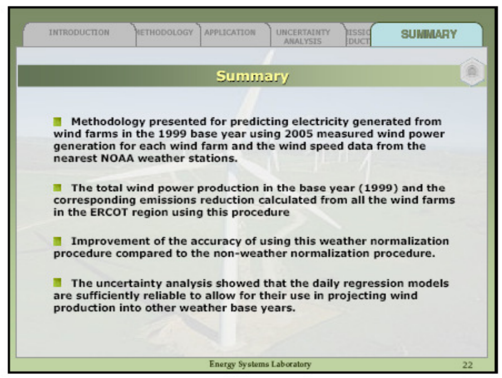


Figure 75: Slides presented at the ICEBO Conference about wind calculations, San Francisco, CA (October 2007).









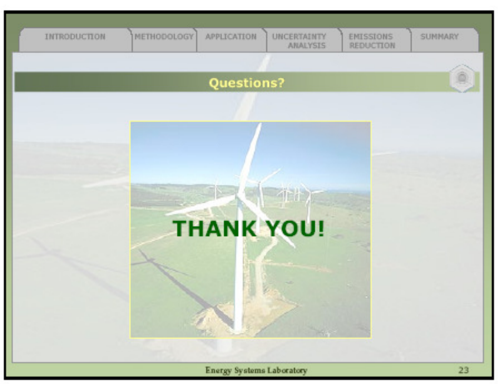
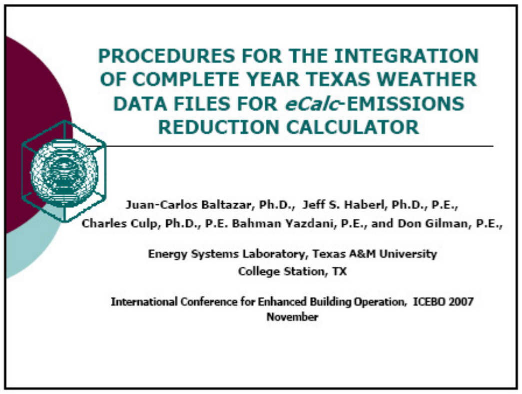
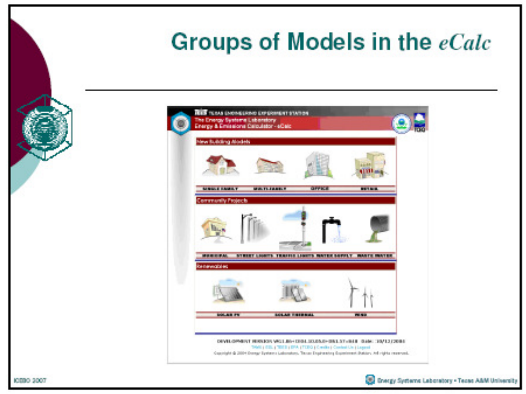


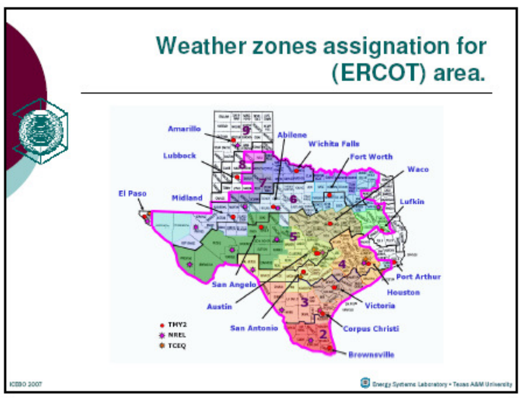
Figure 76: Slides presented at the ICEBO Conference about wind calculations, San Francisco, CA (October 2007).

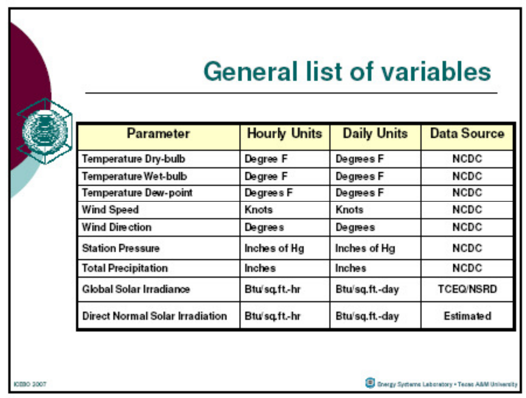
5.2.7.9 Presentation About Weather Analysis at the ICEBO Conference, San Francisco, CA, October 2007.

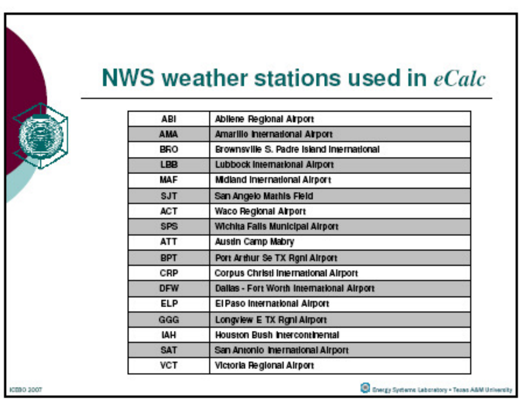
In October 2007, the Laboratory presented a paper at the ICEBO Conference in San Francisco, CA on the procedures developed for compiling annual weather data files containing hourly data.











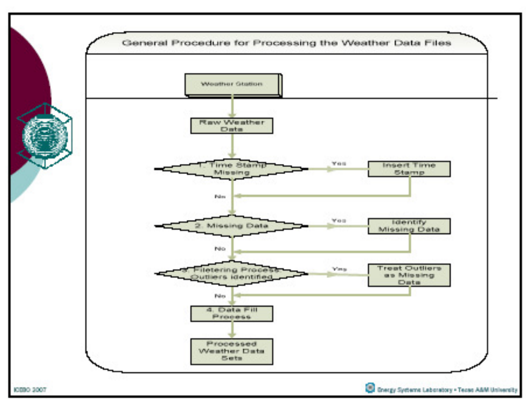
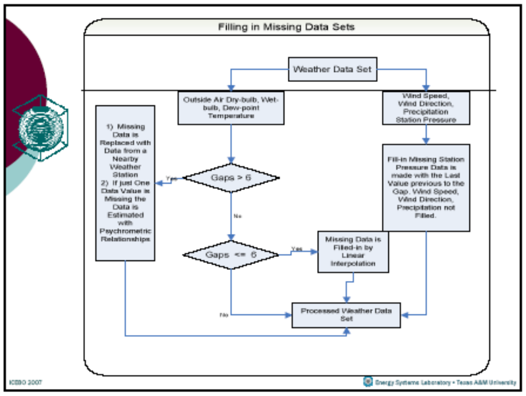
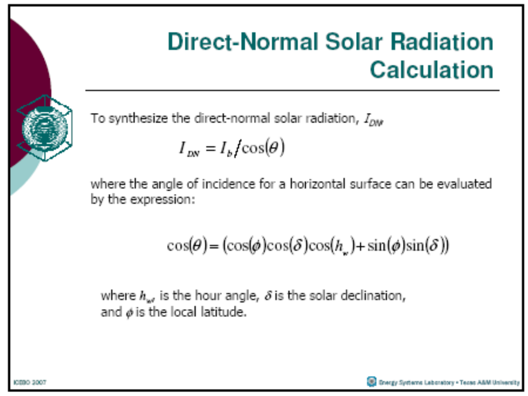
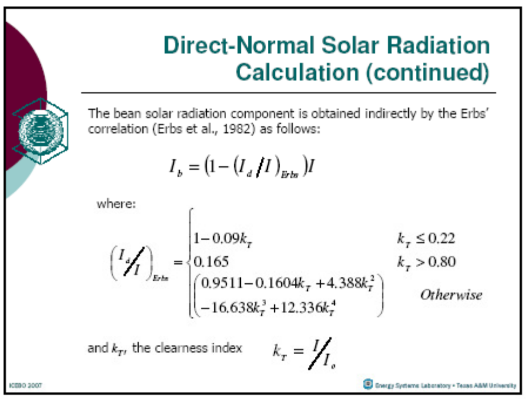
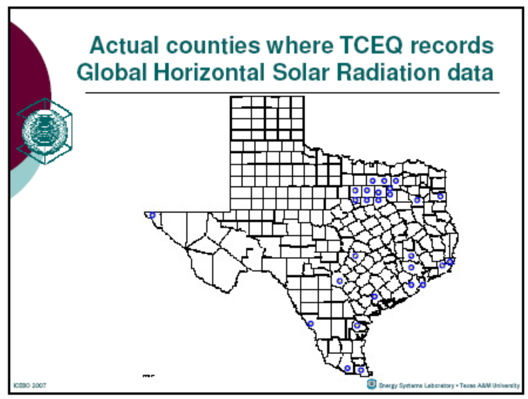


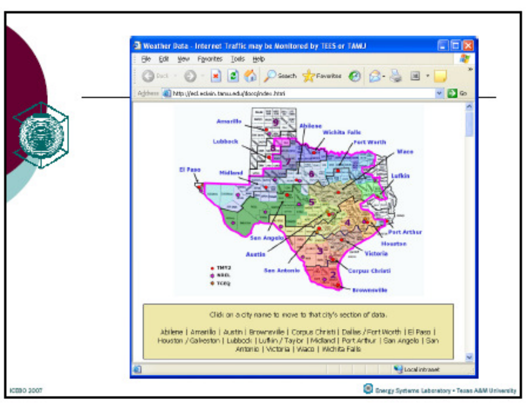
Figure 77: Slides presented at the ICEBO Conference about weather calculations, San Francisco, CA (October 2007).











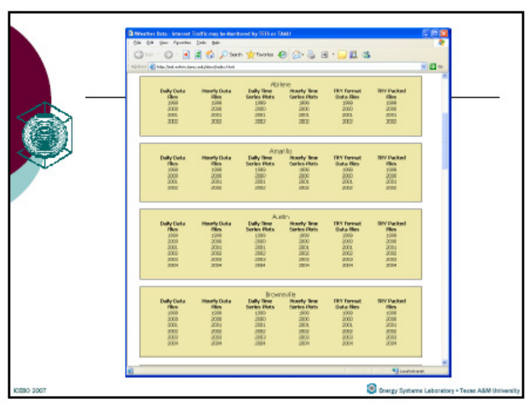
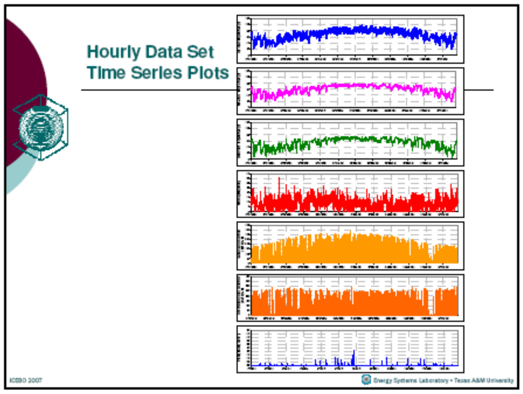
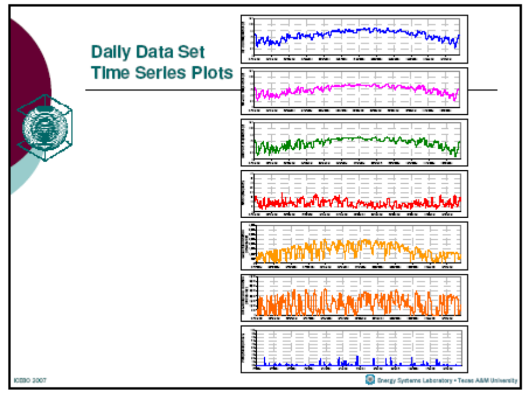
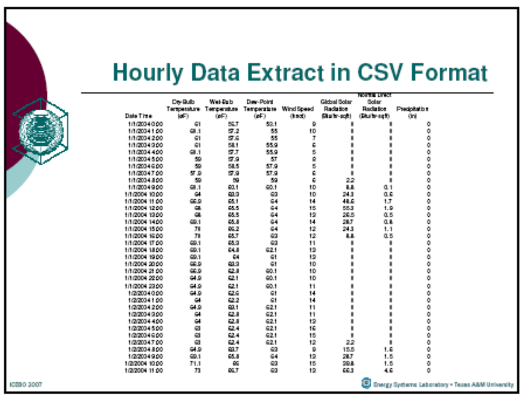
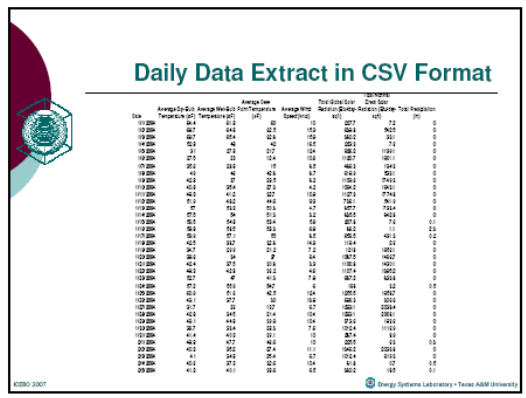


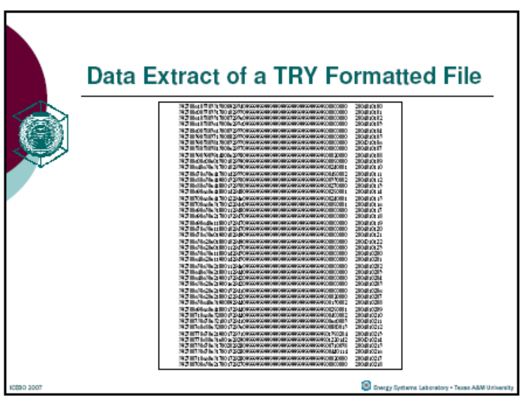
Figure 78: Slides presented at the ICEBO Conference about weather calculations, San Francisco, CA (October 2007).











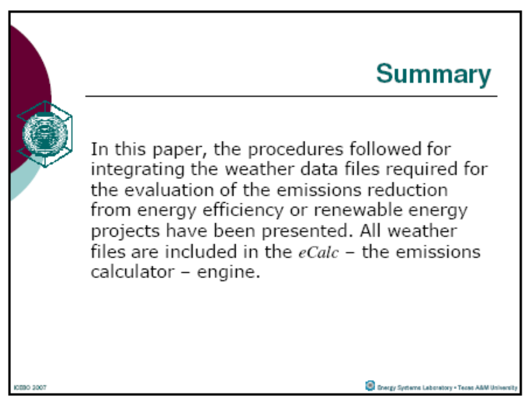
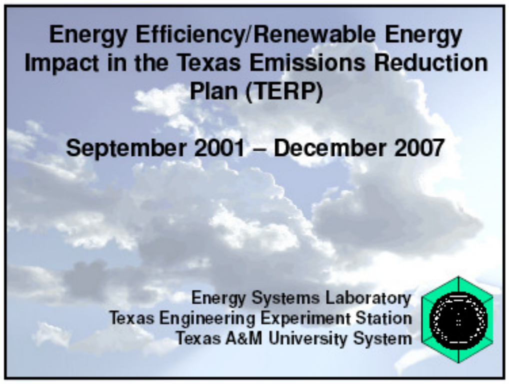
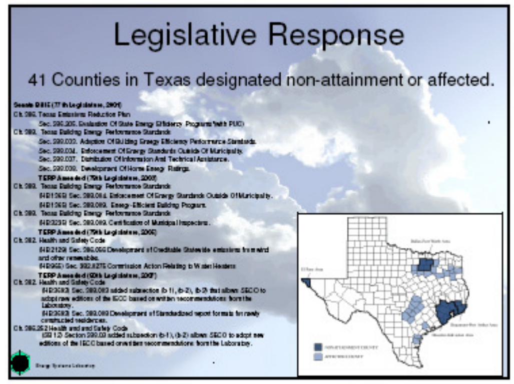


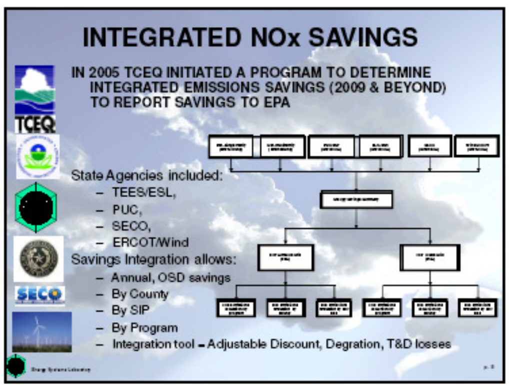
Figure 79: Slides presented at the ICEBO Conference about weather calculations, San Francisco, CA (October 2007).

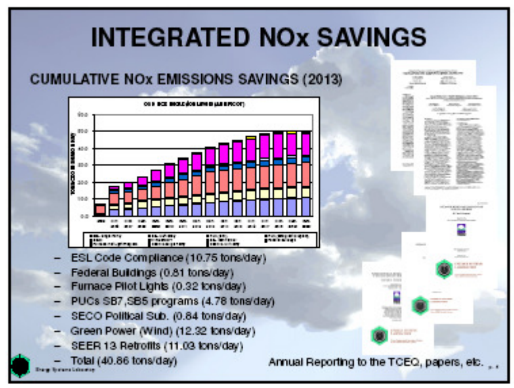
5.2.7.10 Overview Presentation Delivered to the CATEE Conference, San Antonio, TX, December 2009

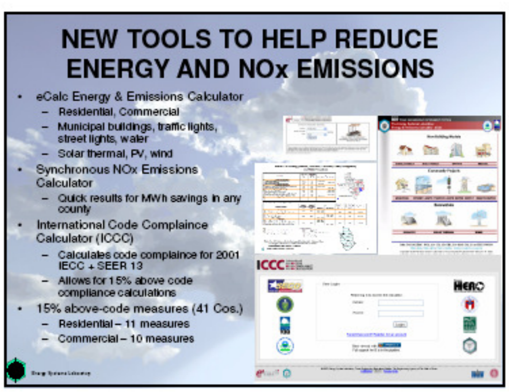
In December 2007, the Laboratory gave a presentation at the CATEE Conference in San Antonio, TX, regarding the impact of energy efficiency and renewable energy on the Texas Emissions Reduction Plan.











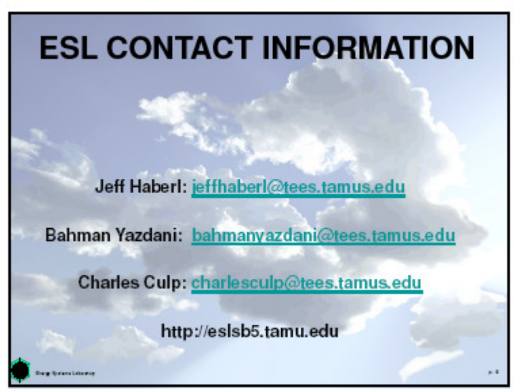
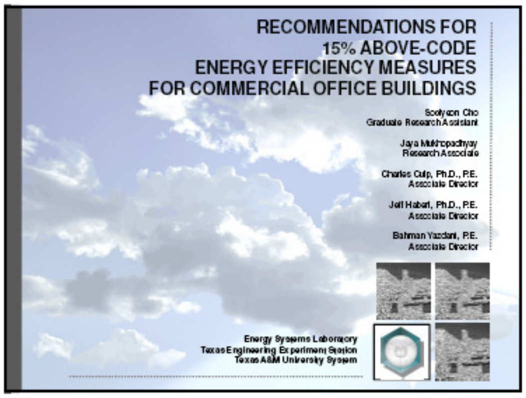
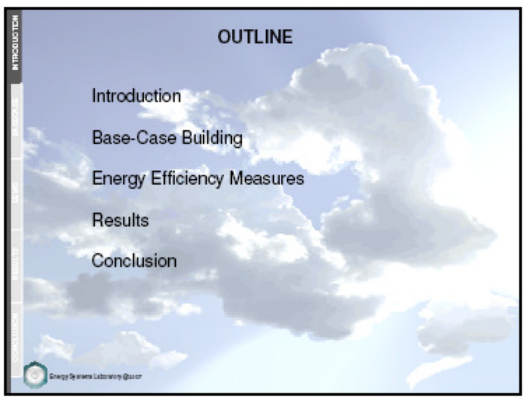


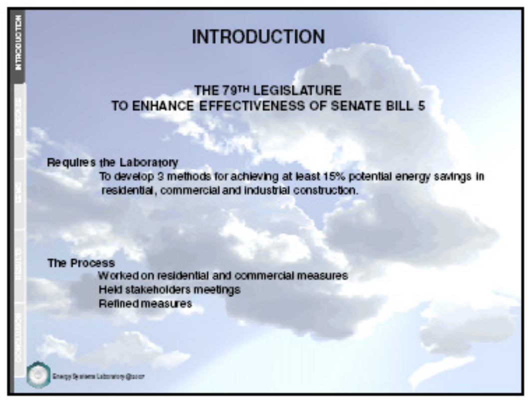
Figure 80: Slides presented at the CATEE Conference about EE/RE, San Antonio, TX, (December 2007).

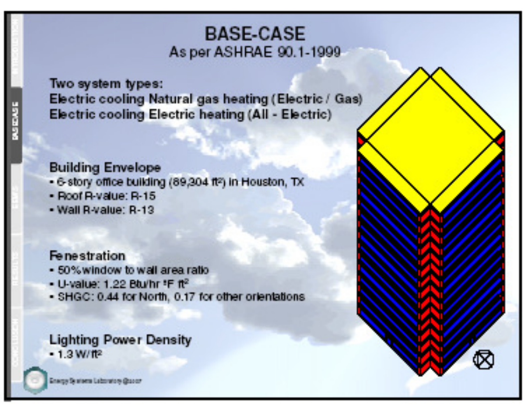
5.2.7.11 Commercial Building Presentation Delivered to the CATEE Conference, December 2009

In December 2008, the Laboratory gave a presentation at the CATEE Conference in San Antonio, TX, regarding 15% above code commercial buildings, .









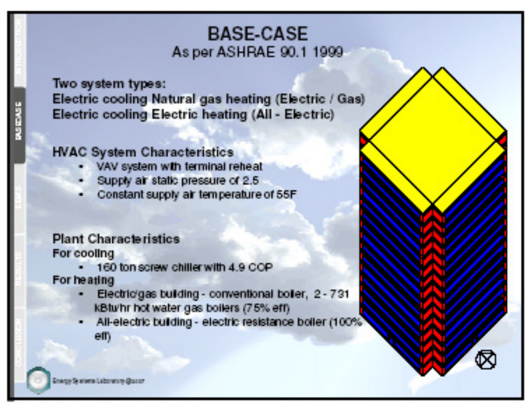
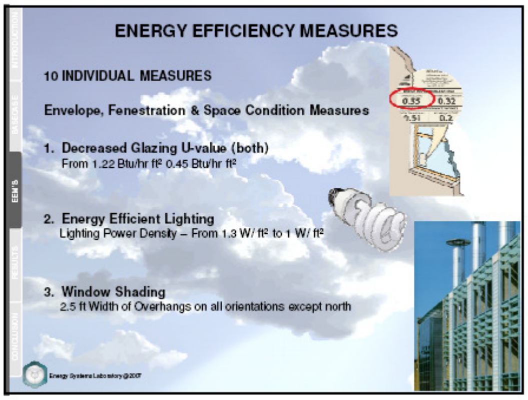
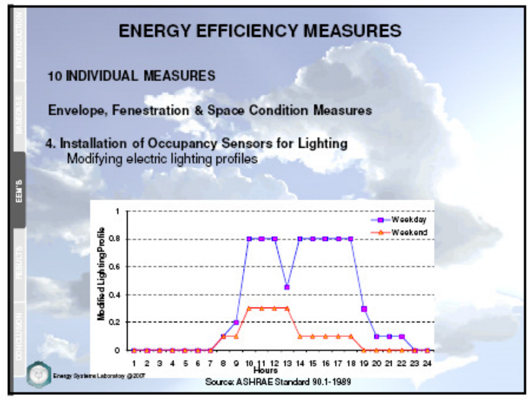
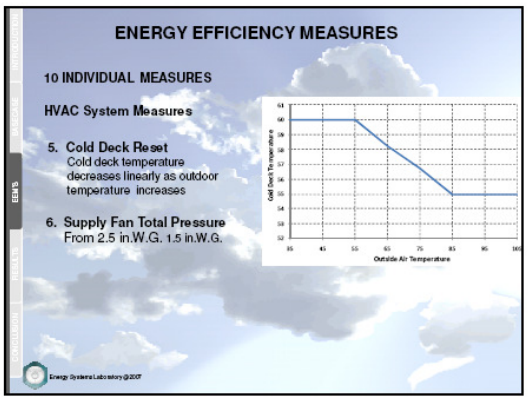
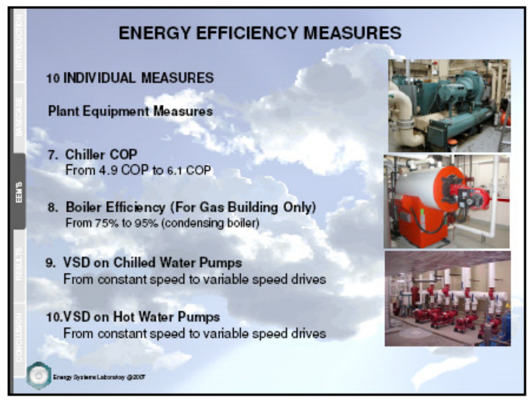


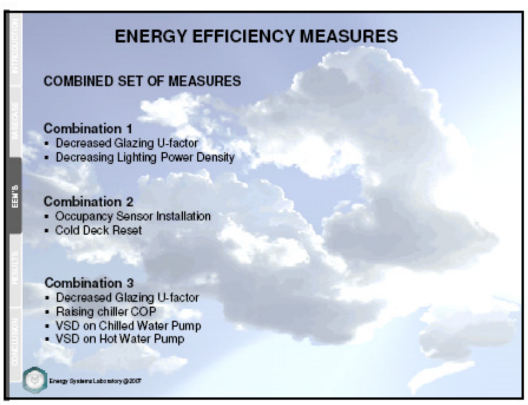
Figure 81: Slides presented at the CATEE Conference about 15% above code Commercial, San Antonio, TX, (December 2007).











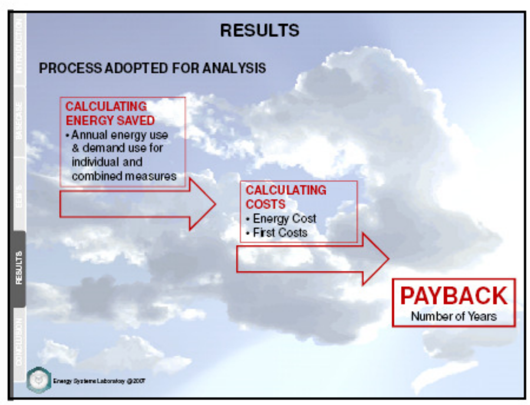
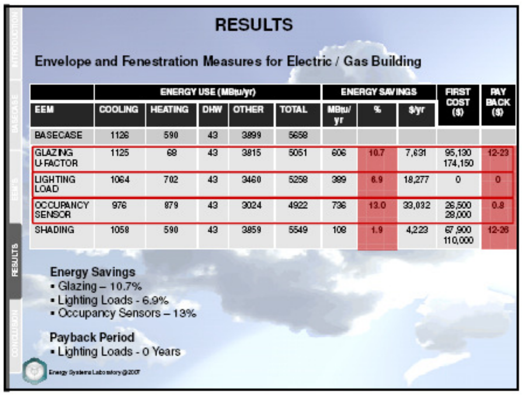
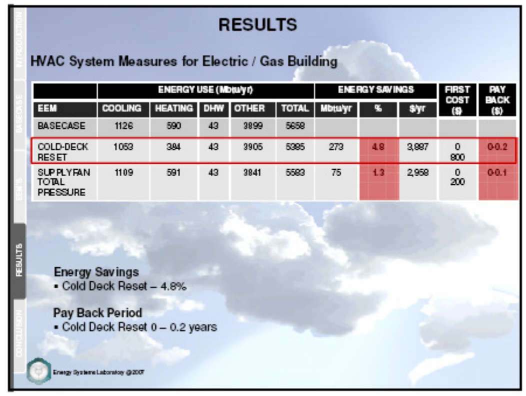


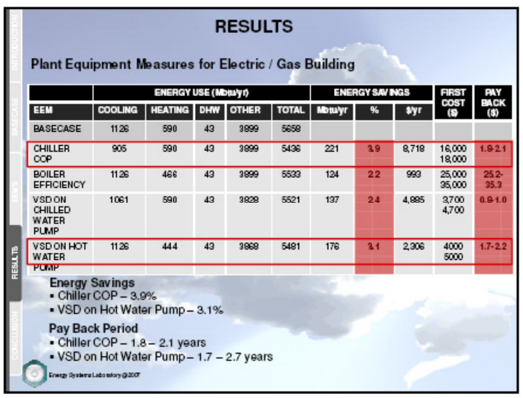
Figure 82: Slides presented at the CATEE Conference about 15% above code Commercial, San Antonio, TX, (December 2007).



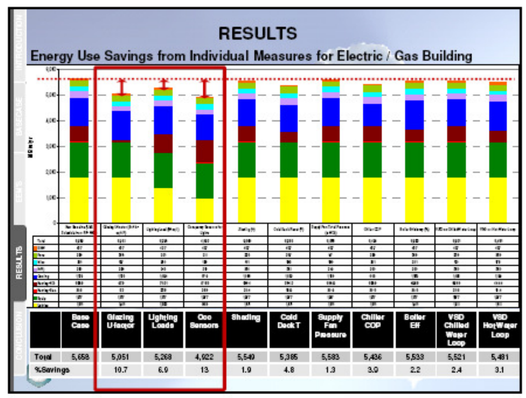
	ENERGY USE (MBtu/yr)					ENERGY SAVINGS			FIRST COST ($)	PAY BACK ($)
EEM	COOLING	HEATING	DHW	OTHER	TOTAL	MBtu/yr	%	$/yr		
BASECASE	1126	590	43	3899	5658					
GLAZING U-FACTOR	1125	68	43	3815	5051	606	10.7	7,631	95,130 174,150	12-23
LIGHTING LOAD	1064	702	43	3460	5258	399	6.9	18,277	0	0
OCCUPANCY SENSOR	976	879	43	3024	4922	736	13.0	33,032	26,500 28,000	0.8
SHADING	1058	590	43	3859	5549	108	1.9	4,223	67,900 110,000	12-26



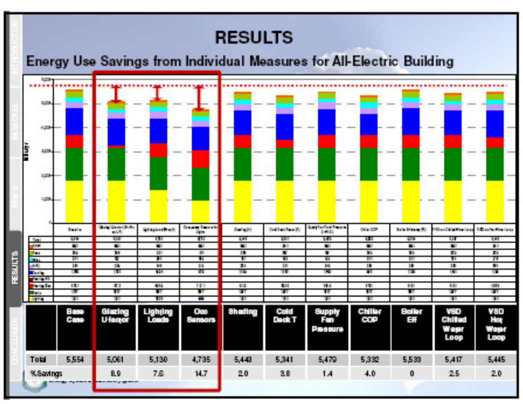
	ENERGY USE (Mbtu/yr)					ENERGY SAVINGS			FIRST COST ($)	PAY BACK ($)
EEM	COOLING	HEATING	DHW	OTHER	TOTAL	Mbtu/yr	%	$/yr		
BASECASE	1126	590	43	3899	5658					
COLD-DECK RESET	1053	384	43	3905	5385	273	4.8	3,887	0 800	0-0.2
SUPPLY FAN TOTAL PRESSURE	1109	591	43	3841	5583	75	1.3	2,958	0 200	0-0.1



	ENERGY USE (Mbtu/yr)					ENERGY SAVINGS			FIRST COST ($)	PAY BACK ($)
EEM	COOLING	HEATING	DHW	OTHER	TOTAL	Mbtu/yr	%	$/yr		
BASECASE	1126	590	43	3899	5658					
CHILLER COP	905	590	43	3899	5436	221	3.9	8,718	16,000 18,000	1.8-2.1
BOILER EFFICIENCY	1126	466	43	3899	5533	124	2.2	993	25,000 35,000	25.2-35.3
VSD ON CHILLED WATER PUMP	1061	590	43	3828	5521	137	2.4	4,885	3,700 4,700	0.8-1.0
VSD ON HOT WATER PUMP	1126	444	43	3868	5481	176	3.1	2,306	4000 5000	1.7-2.2



	Base Case	Glazing U-factor	Lighting Loads	Occ Sensors	Shading	Cold Deck T	Supply Fan Pressure	Chiller COP	Boiler Eff	VSD Chilled Water Loop	VSD Hot Water Loop
Total	5,658	5,051	5,268	4,922	5,549	5,385	5,583	5,436	5,533	5,521	5,481
%Savings		10.7	6.9	13	1.9	4.8	1.3	3.9	2.2	2.4	3.1



	Base Case	Glazing U-factor	Lighting Loads	Occ Sensors	Shading	Cold Deck T	Supply Fan Pressure	Chiller COP	Boiler Eff	VSD Chilled Water Loop	VSD Hot Water Loop
Total	5,554	5,061	5,130	4,735	5,443	5,341	5,479	5,332	5,533	5,417	5,445
%Savings		8.9	7.6	14.7	2.0	3.8	1.4	4.0	0	2.5	2.0

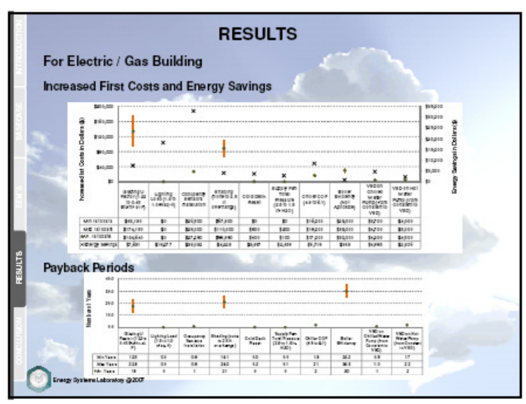
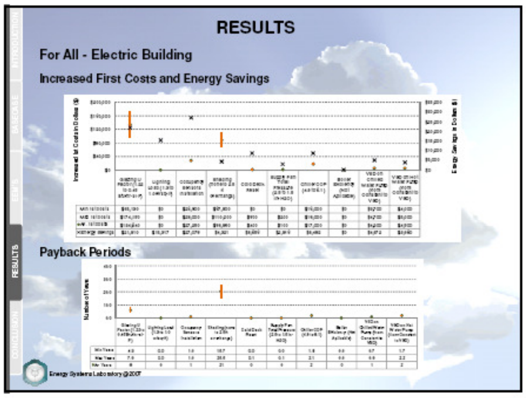
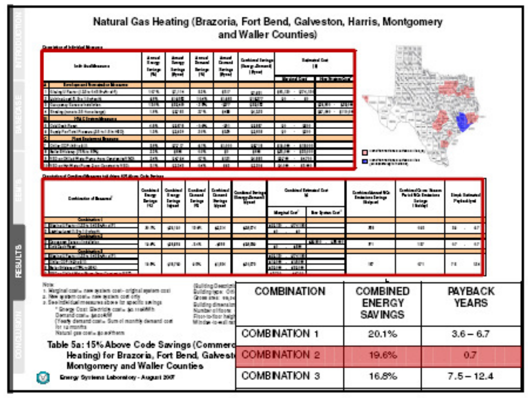
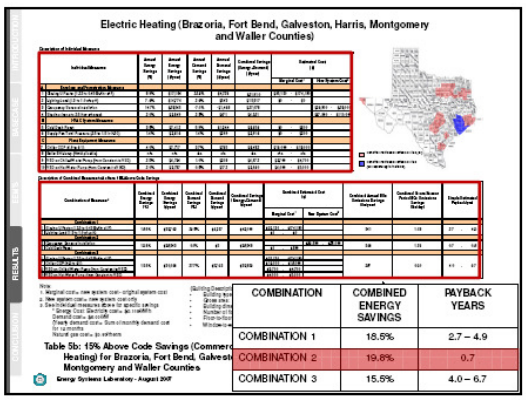
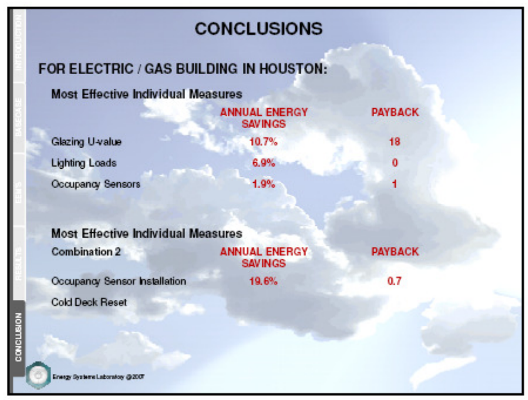


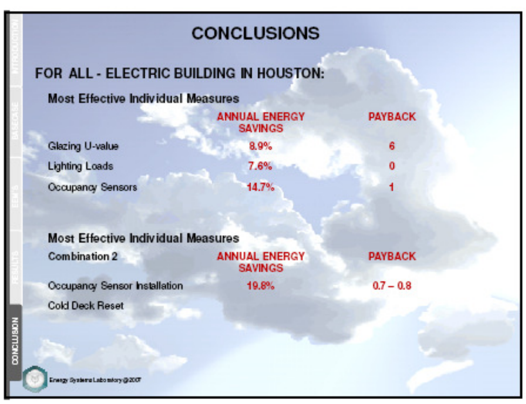
Figure 83: Slides presented at the CATEE Conference about 15% above code Commercial, San Antonio, TX, (December 2007).











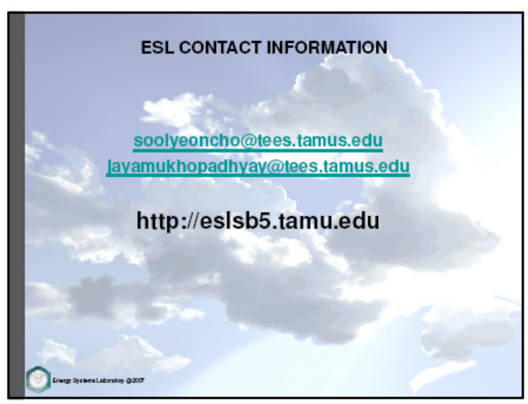
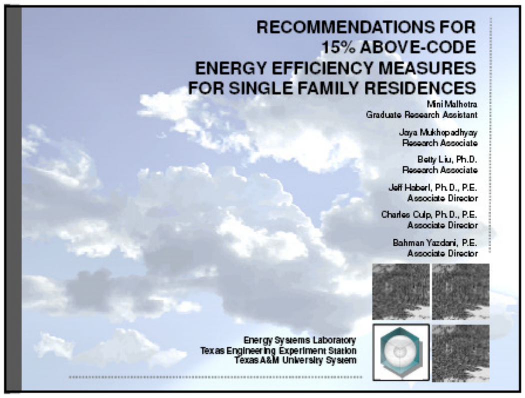
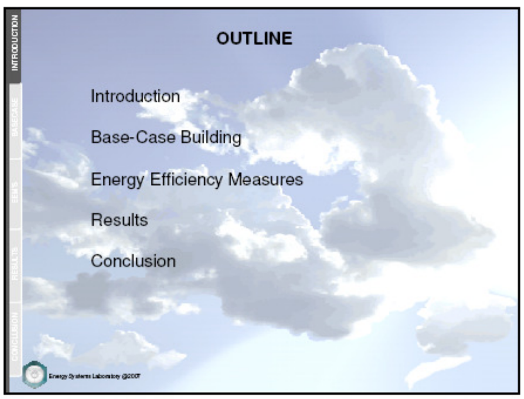


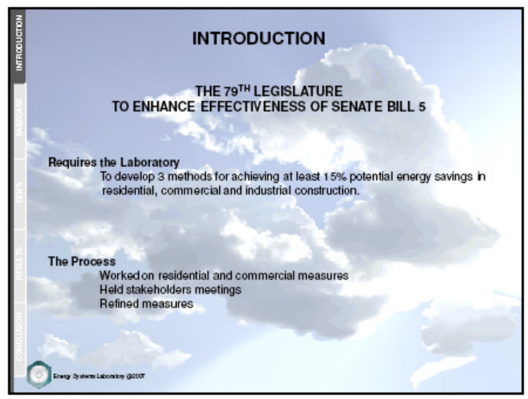
Figure 84: Slides presented at the CATEE Conference about 15% above code Commercial, San Antonio, TX, (December 2007).

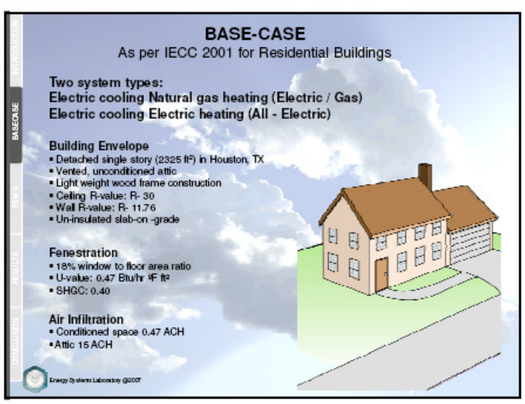
5.2.7.12 15% above code Residential Presentation Delivered to the CATEE Conference, December 2009

In December 2007, the Laboratory gave a presentation at the CATEE Conference in San Antonio, TX, regarding 15% above code residential buildings.









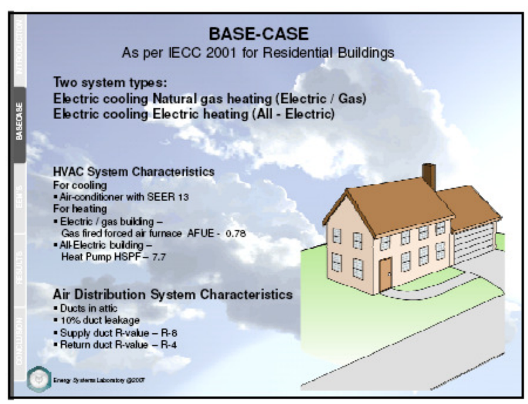
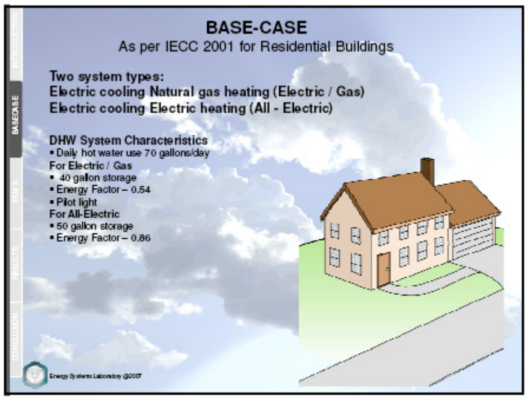
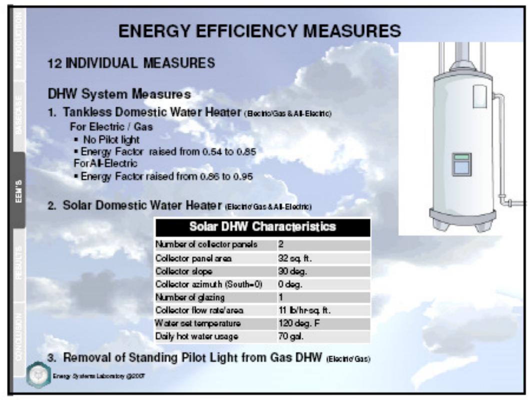
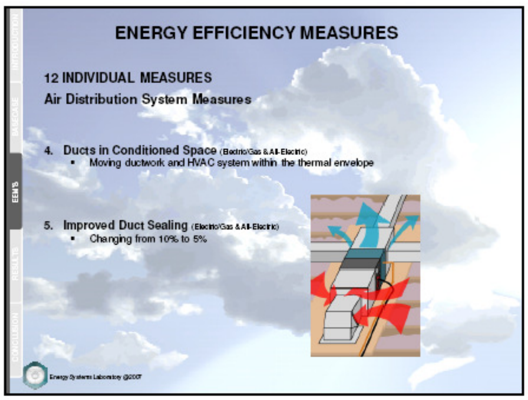
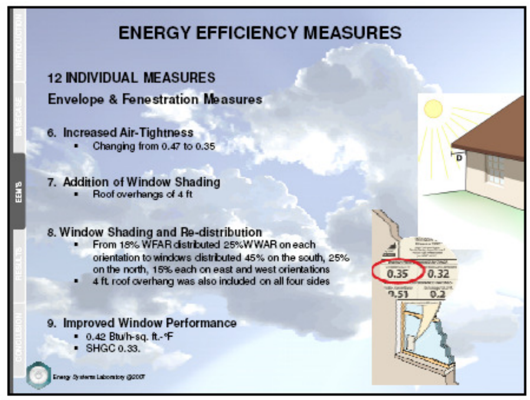


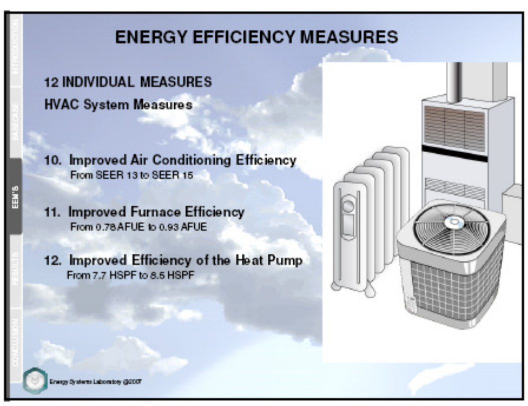
Figure 85: Slides presented at the CATEE Conference about 15% above code residential, San Antonio, TX, (December 2007).











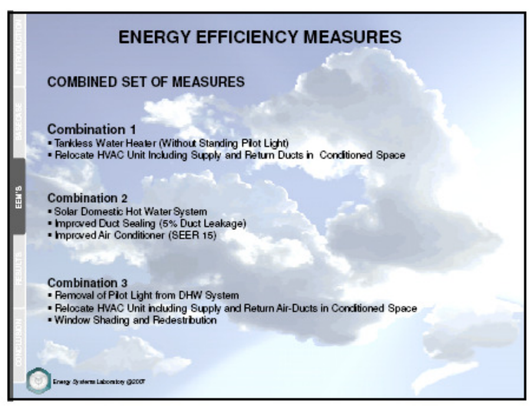
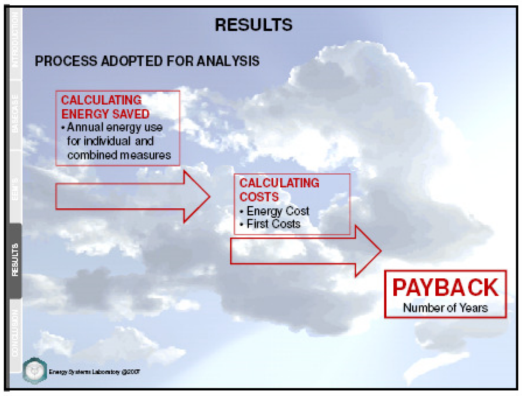
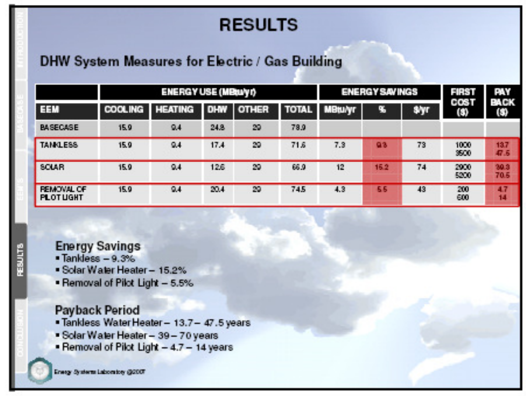
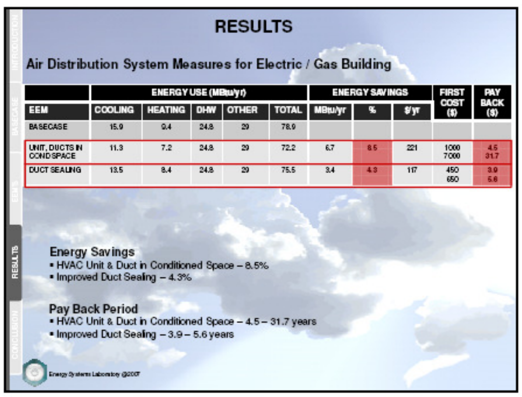
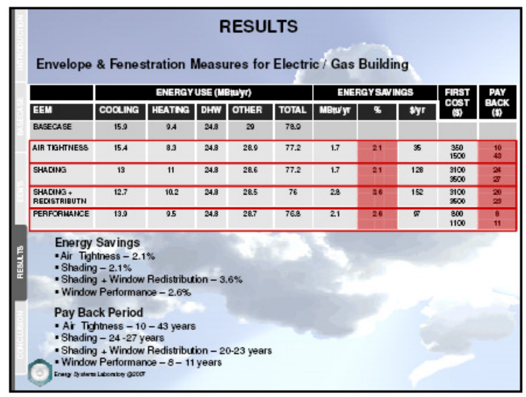


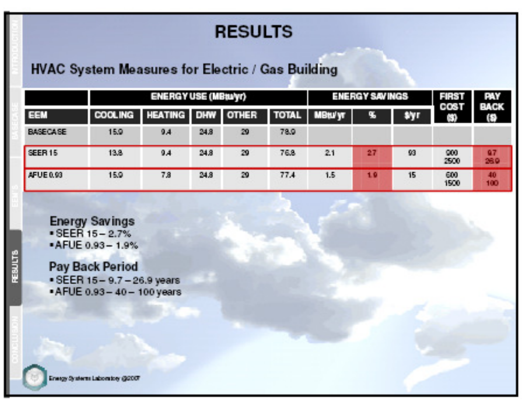
Figure 86: Slides presented at the CATEE Conference about 15% above code residential, San Antonio, TX, (December 2007).











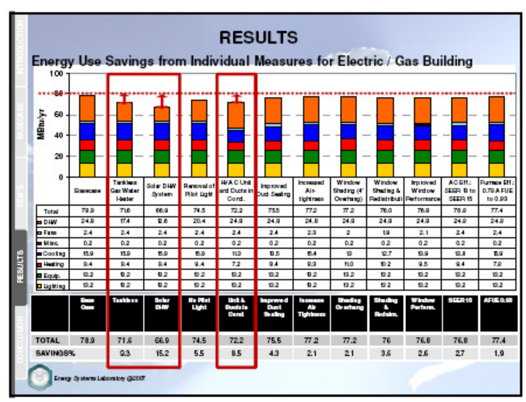
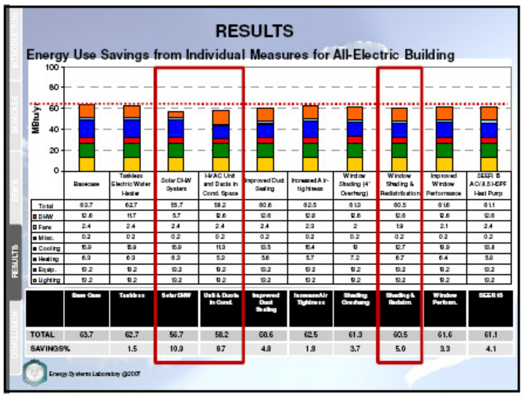
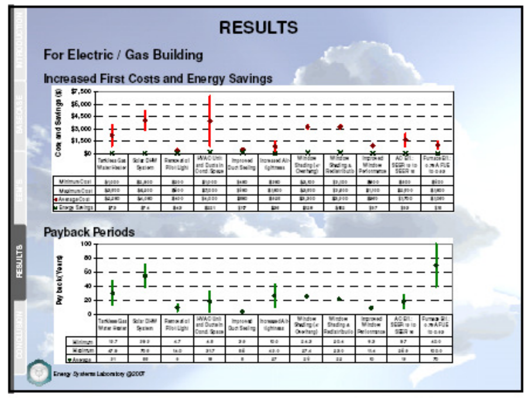
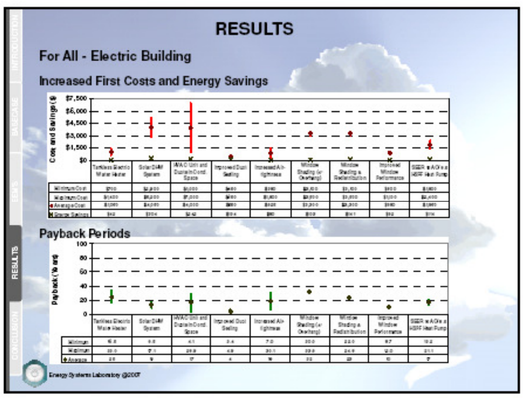
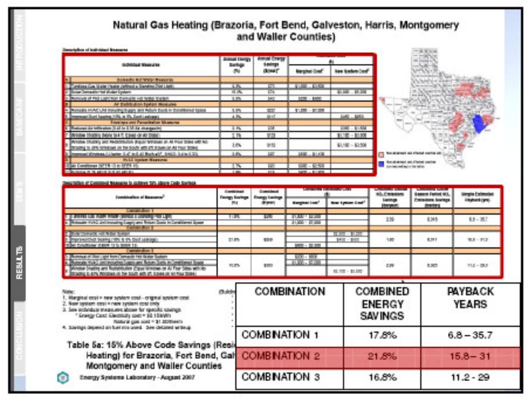


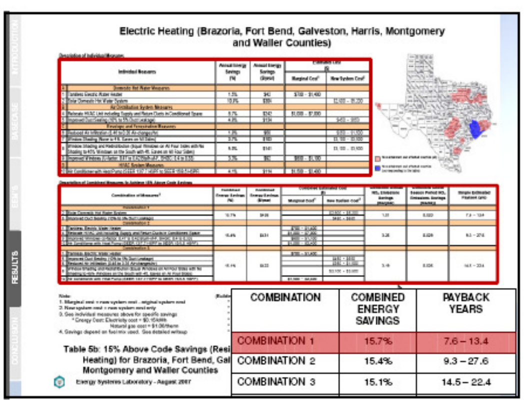
Figure 87: Slides presented at the CATEE Conference about 15% above code residential, San Antonio, TX, (December 2007).











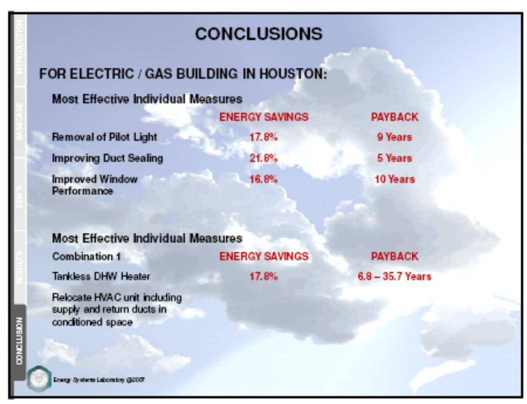
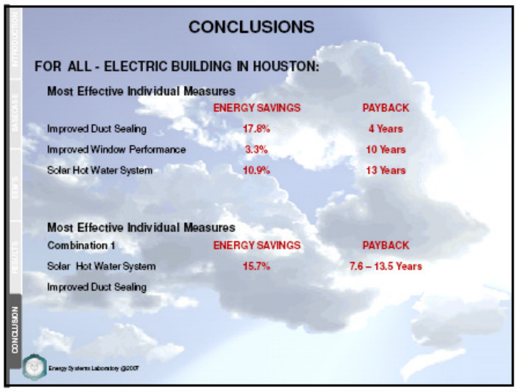


Figure 88: Slides presented at the CATEE Conference about 15% above code residential, San Antonio, TX, (December 2007).



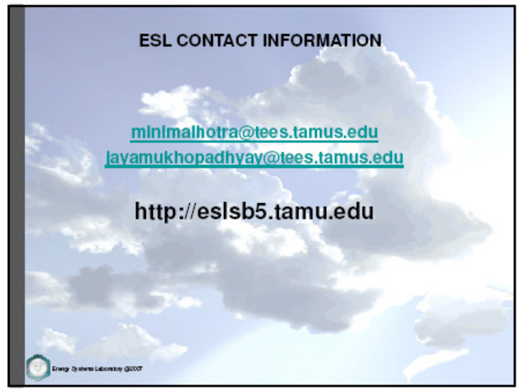
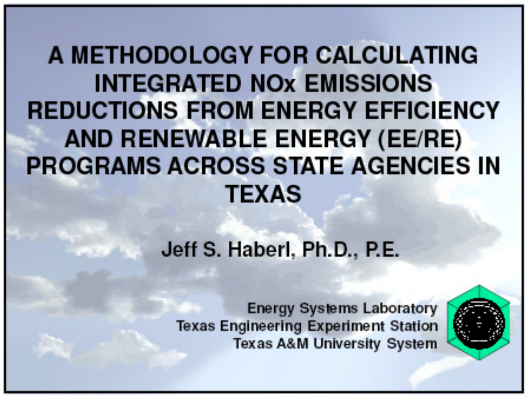
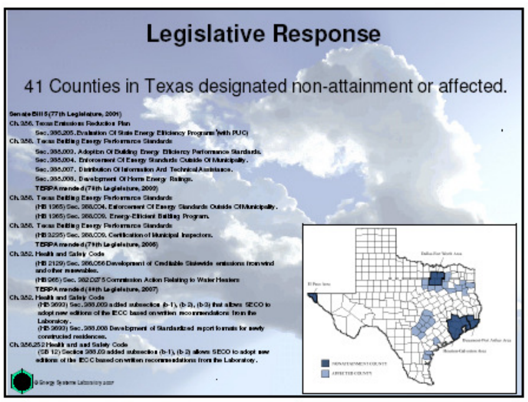


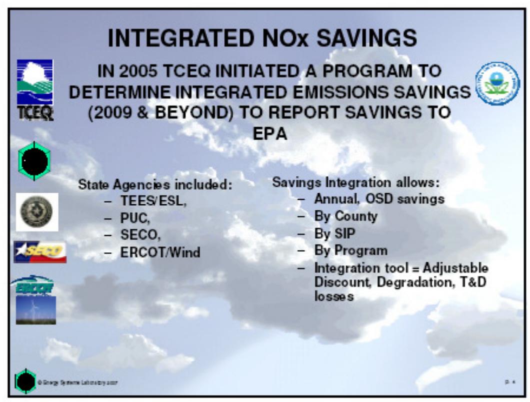
Figure 89: Slides presented at the CATEE Conference about 15% above code residential, San Antonio, TX, (December 2007).

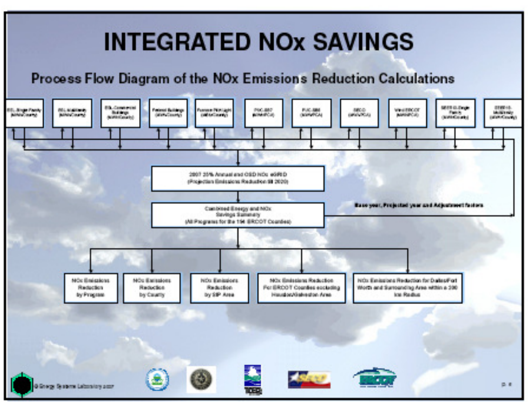
5.2.7.13 Presentation Regarding EE/RE and the TERP Delivered to the CATEE Conference, December 2009

In December 2007, the Laboratory gave a presentation at the CATEE Conference in San Antonio, TX, regarding integration of EE/RE into the TERP.









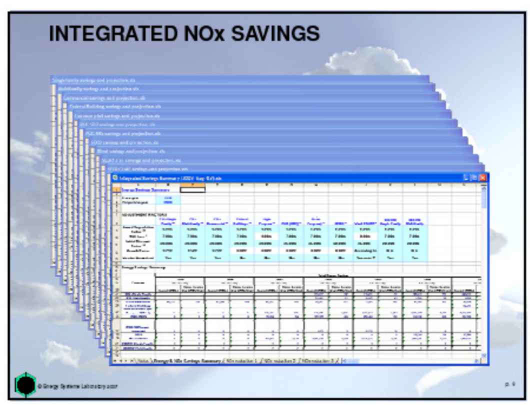
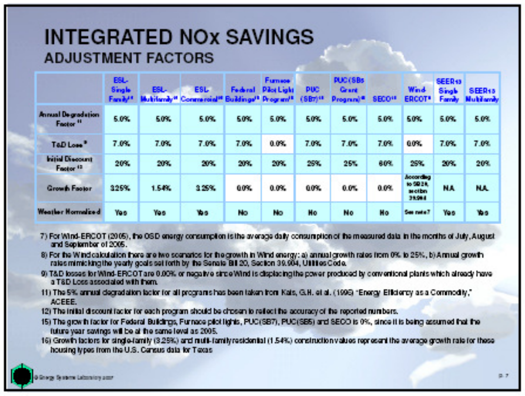
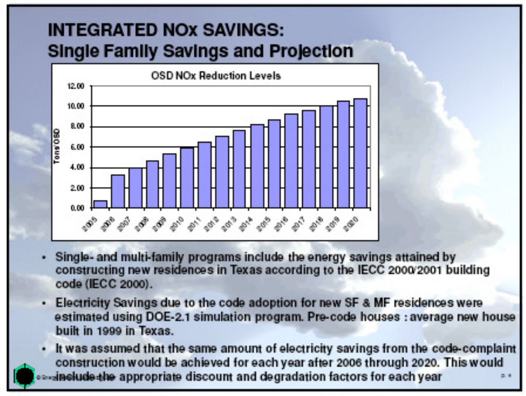
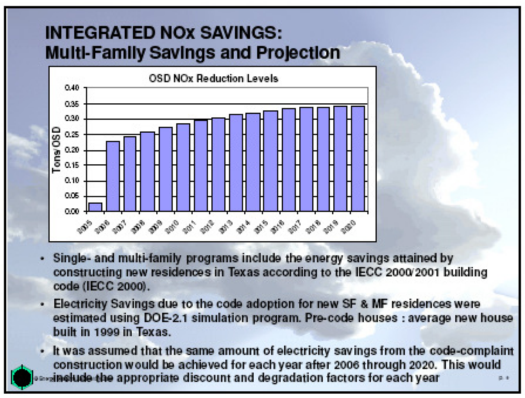


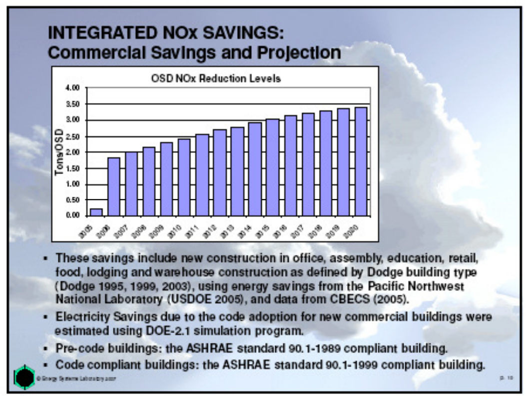
Figure 90: Slides presented at the CATEE Conference about EE/RE and the TERP, San Antonio, TX, (December 2007).

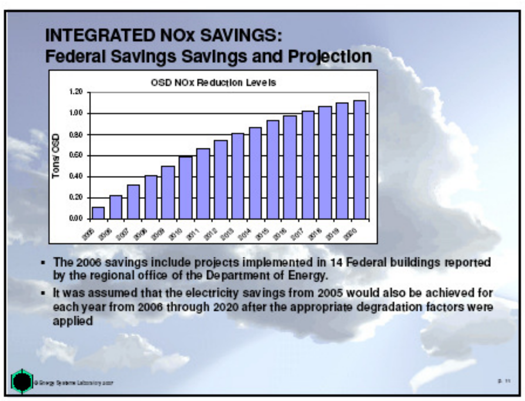


	ESL-Single Family[16]	ESL-Multifamily[16]	ESL-Commercial[16]	Federal Buildings[15]	Furnace Pilot Light Program[15]	PUC (SB7)[15]	PUC (SB5 Grant Program)[15]	SECO[15]	Wind-ERCOT[8]	SEER13 Single Family	SEER13 Multifamily
Annual Degradation Factor [11]	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
T&D Loss [9]	7.0%	7.0%	7.0%	7.0%	0.0%	7.0%	7.0%	7.0%	0.0%	7.0%	7.0%
Initial Discount Factor [12]	20%	20%	20%	20%	20%	25%	25%	60%	25%	20%	20%
Growth Factor	3.25%	1.54%	3.25%	0.0%	0.0%	0.0%	0.0%	0.0%	According to SB20, section 39.904	N.A.	N.A.
Weather Normalized	Yes	Yes	Yes	No	No	No	No	No	See note 7	Yes	Yes









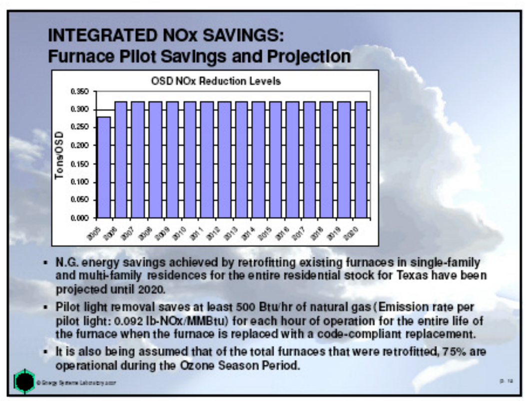


Figure 91: Slides presented at the CATEE Conference about EE/RE and the TERP, San Antonio, TX, (December 2007).

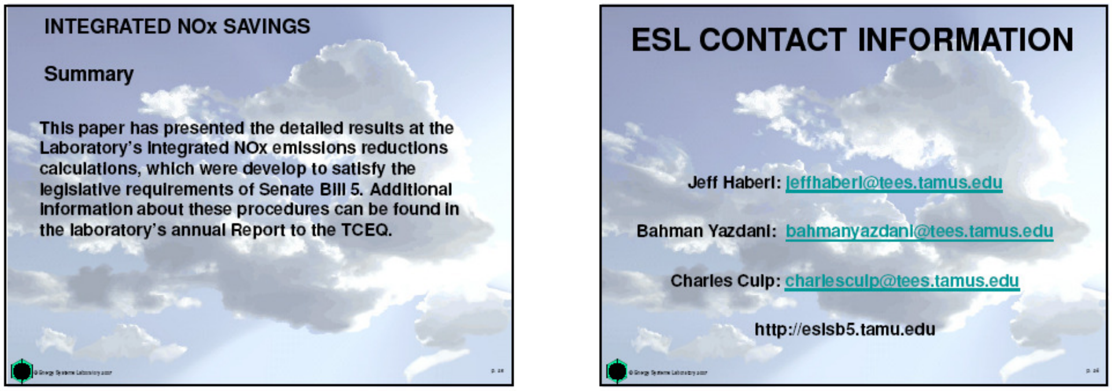


Figure 92: Slides presented at the CATEE Conference about EE/RE and the TERP, San Antonio, TX, (December 2007).

5.2.8 Presented Two Papers at the 2007 ICEBO Conference in San Francisco, October 2007.

Two papers were prepared and presented a the 2007 ICEBO conference in San Francisco, California, in October 2007. Copies of these papers have been posted on the Laboratory's TERP web page. Titles and abstracts for each of the papers are as follows.

Liu, Z., Haberl, J., Baltazar-Cervantes, J.C., Subbarao, K., Culp, C., Yazdani, B. 2007. "A Methodology for Calculating Emissions Reductions From Renewable Energy Programs and it Application to the Wind Farms in the Texas ERCOT Region", *Proceedings of the 8th International Conference for Enhanced Building Operation*", San Francisco, CA, published on CD ROM (October).

This paper provides a detailed description of the methodology developed to calculate the emissions reductions from electricity provided by a wind farm. Details are presented from the Sweetwater I facilitly as well as an application of the procedure across all wind farms in Texas.

Baltazar-Cervantes, J.C., Haberl, J., Culp, C., Yazdani, B., Gilman, D. 2007. "Procedures for the Integration of Complete Year Texas Weather Data Files for eCalc Emissions Reduction Calculator", *Proceedings of the 8th International Conference for Enhanced Building Operation*", San Francisco, CA, published on CD ROM (October).

This paper describes the procedures that have been followed to assemble annual files of hourly weather data that are required to assess the emissions reductions due to the electricity savings from the implementation of energy efficiency and renewable energy.

5.2.9 Presented Two Papers at the 2007 Hot and Humid Conference in San Antonio, Texas, December 2007.

Four papers were prepared and presented a the 2007 Hot and Humid conference in San Antonio, Texas, in December, 2007. Copies of these papers have been posted on the Laboratory's TERP web page. Titles and abstracts for each of the papers are as follows.

Baltazar-Cervantes, J.C., Im, P., Haberl, J., Liu, Z., Mukhopadhyay, Culp, C., J., Kim, S., Gilman, D., Yazdani, B. 2007. "A Methodology for Calculating Integrated Emissions Reductions From Energy Efficiency and Renewable Energy (EE/RE) Programs Across State Agencies in Texas", *Proceedings of the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates,* Texas A&M University, San Antonio, Texas, published on CD ROM (December).

This paper presents a summary of the integrated NOx emissions reduction calculation procedures developed by the Energy Systems Laboratory (ESL) to satisfy the reporting requirements for Senate Bill 5, including savings from Federal buildings, furnace pilot light upgrades, the TPUC programs, SECO programs, and electricity generated from wind energy.

Malhotra, M., Mukhopadhyay, J., Liu, Z., Culp, C., Haberl, J., Yazdani, B. 2007. "Recommendaitons for 15% Above Code Energy Efficiency Measures for Single-family Residences", *Proceedings of the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates,* Texas A&M University, San Antonio, Texas, published on CD ROM (December).

This paper presents an overview of the recommendations for achieving 15% above code energy performance using a simulation model for a single-family residence. The recommendations include twelve measures: tankless water heaters, solar domestic water heating, gas water heaters with electronic ignition, ducts in conditioned spaces, improved duct sealing, increased air tightness, window shading and redistribution, improved window performance, and improved heating/cooling system efficiency.

Cho, S., Mukhopadhyay, J., Culp, C., Haberl, J., Yazdani, B. 2007. "Recommendaitons for 15% Above Code Energy Efficiency Measures for Commercial Buildings", *Proceedings of the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates,* Texas A&M University, San Antonio, Texas, published on CD ROM (December).

This paper presents an overview of the recommendations for achieving 15% above code energy performance using a simulation model for a commercial office building. The recommendations include: improved glazing, decreased lighting power density, window shading, reduced static pressure, improved chiller performance, improved boiler efficiency, cold deck reset, VSDs on pumps and occupancy sensors.

Morgan, R., Gilman, D., Mukhopadhyay, J., Marshall, K., Stackhouse, R., Cordes, J., Liu, Z., Montgomery, C., Haberl, J., Culp, C., Yazdani, B. 2007. "Development of a Residential Code-compliant Calculator for the Texas Climate Vision Project", *Proceedings of the 15.5 Symposium on Improving Building Systems in Hot and Humid Climates,* Texas A&M University, San Antonio, Texas, published on CD ROM (December).

This paper reports on the progress of developing a web-based code-compliant calculator to assist the City of Austin with the design and construction of houses that are 20 to 40% above code. It provides an overview of the permitting process, and how the web-based software collects, calculates and certifies above-code compliance, including input from building inspectors regarding what actually was built.

6 CALCULATED NOx REDUCTION POTENTIAL FROM IMPLEMENTATION OF THE IECC / IRC

6.1 Calculated 2007 Electricity and Natural Gas Savings Due to the Implementation of the IECC / IRC to New Residential Construction (Single-family and Multi-family), and Commercial Buildings Using Code-traceable, Fuel-Neutral Simulation.

A complete reporting of the savings from the implementation of the IECC / IRC requires tracking and analyzing savings to new construction and construction activity to existing buildings that undergoes a building permit. Adoption of the IECC / IRC is expected to impact the following types of buildings:

- single-family residential
- multi-family residential
- commercial buildings
- industrial buildings
- renewables

Adoption of the IECC / IRC is also expected to impact construction activity in existing buildings that undergoes a building permit. Such activity would impact the following types of buildings:

- single-family residential
- multi-family residential
- commercial buildings
- industrial buildings
- renewables

The following sections report calculations of the energy savings associated only with new construction activity in new residences (i.e., single-family and multi-family), and commercial construction. Calculation of energy savings adoption of the IECC / IRC in industrial building and renewables is currently under development at the Laboratory, and will be reported in future reports.

6.1.1 2007 Results for New Single-family Residential Construction.

In this section of the report, calculations are provided regarding the potential electricity reductions and associated emissions reductions from the implementation of the IECC / IRC to new single-family residences in the 41 non-attainment and affected counties as well as other counties in ERCOT region[20]. To calculate the NOx emissions reductions from the implementation of the IECC / IRC, a number of procedures were followed. First, new construction activity by county had to be determined; then energy savings attributable to the IECC / IRC had to be modeled using the code-traceable, DOE-2 simulation that the Laboratory has developed for the TERP; these estimates were then applied to the NAHB Builder's survey data to determine the appropriate number of housing types; then estimates of the NOx reduction potential from the electricity reductions in each county were calculated using the US EPA's 2007 eGRID database[21].

In Table 30 and Table 31, the 1999 and IECC / IRC code-compliant building characteristics are shown for each county. The 1999 building characteristics reflect those published by the NAHB, ARI and GAMA for Texas. The IECC / IRC code-compliant characteristics are the minimum building code characteristics required by the IECC / IRC for each county for single-family residences (i.e., Type A.1)[22]. In Table 30 and Table 31, the rows are sorted first by the US EPA's non-attainment, affected designation, and other ERCOT Counties, then alphabetically. Next, in the third column, the NAHB survey classification is listed. The fourth column in Table 30 and Table 31 lists the window area for the

[20] The three new counties, Henderson, Hood and Hunt were added in the 2003 Legislative session are included in this.
[21] This preliminary analysis does not include actual power transfers on the grid, and assumes transmission and distribution losses of 7%. Counties were assigned to utility service districts as indicated.
[22] As modified by the 2001 Supplement.

average house as defined by the NAHB survey[23]. The fifth, sixth, seventh, eighth, and ninth columns show the NAHB's average glazing U-value, Solar Heat Gain Coefficient (SHGC), roof insulation and wall insulation, respectively. In columns nine through thirteen of Table 30 and Table 31, the corresponding values from the IECC / IRC code-compliant house are listed for each county (i.e., percent area, glazing U-value, SHGC, roof and wall insulation R-value). For each county, the identical window percent area was used for the 1999 and code-compliant calculation (i.e., window-to-wall area).

The IECC / IRC SHGC is 0.4 for all non-attainment and affected counties since they all fall below the 3,500 HDD_{65}, as required by the IECC / IRC. All the 1999 houses were assumed to have an air-conditioner efficiency[24] equal to a SEER 11, a furnace efficiency (AFUE) of 0.80, and a domestic water heater efficiency of 76%. All the IECC/IRC code-compliant houses were assumed to have an air-conditioner efficiency equal to a SEER 13[25]. The values shown in Table 30 and Table 31, represent the only changes that were made to the simulation to obtain the savings calculations. All other variables in the simulation remained the same for the 1999 and IECC / IRC code-compliant simulation. In cases where the 1999 values were more efficient than the IECC / IRC code-compliant simulation, the 1999 values were used in both simulations, since this indicates that the prevailing practice is already above code. For example, in Brazoria County, according to the NAHB, the roof insulation is R-27.08, which is already above the code-required insulation of R-19. Therefore, R-27.08 was used in both simulations.

In the code-traceable simulation results are shown for each county. In a similar fashion as Table 30 and Table 31, Table 32 and Table 33 is first divided into US EPA affected and then non-attainment classifications, followed by an alphabetical listing of counties. In the third column, the IECC / IRC climate zone is listed followed by the number of projected new housing units[26] in the fourth column. In the fifth column, the total simulated energy use is listed if all new construction had been built to pre-code specifications, and, in the sixth column, the total county-wide energy use for code-compliant construction is shown.

The values in the fifth and sixth columns come from the associated tables in the 2007 Volume III Appendix. , which remain the same as the 2006 listing, 24 simulations were run for each county, which were then distributed according to the NAHB's survey data to account for 1 story, 2 story, slab-on-grade, crawlspace, and three different system types. In the seventh and eighth columns, the total pre-code and code-compliant peak OSD energy use is reported for the Ozone Season Day across all counties[27]. In a similar fashion as the annual pre-code and code-compliant energy use, these values are from the associated tables for each county in the Volume III Appendix to this report for the 1999 peak OSD results.

In the ninth and tenth columns, the total annual electricity and peak OSD savings are shown for each county, respectively. A 7% transmission and distribution loss is used in the 2007 report, which represents a fixed 1.07 multiplier for the electricity use. In the eleventh and twelfth columns, the total annual pre-code and code-compliant natural gas use is shown for those residences that had natural gas-fired furnaces and domestic water heaters. Similarly, in columns thirteen and fourteen, the simulated total peak OSD natural gas use on the peak Ozone Season Day (OSD) is shown for each county. Finally, in columns fifteen and sixteen, the total annual and peak OSD natural gas savings are shown for each county.

Table 34 and Table 35 the 2006 PCA assignments for each county are shown. These assignments are the same with the assignments used in the 2006 annual report. These assignments were expanded from the 2005 report because all ERCOT counties are shown in the 2006 report. In Table 36, the annual electricity savings are assigned to PCA provider(s) according to Table 34 and Table 35. The total electricity savings for each PCA, as shown in then entered into the bottom row of Table 37 and Table 39, which is the 2007 US EPA eGRID database for Texas. eGRID then proportions each MWh of electricity savings according to the 1999 measured data from the power plants assigned to that PCA. For each county in which there is a power plant the lbs-NOx/MWh are calculated and displayed as NOx reductions (lbs) in the column adjacent to the PCA column. Adding across the rows then totals the NOx reductions in each county from multiple PCAs that have power plants in that county. Counties that do not show NOx reductions

[23] This value represents the NAHB's reported number of window units times an average window size of 3 x 5 feet, which was determined by surveying local building suppliers. Additional information about the procedures used to determine these values can be found in the MS Thesis by Im (2003).
[24] The choice of a SEER 11 efficiency for the air conditioner was based on ARI sales numbers for Texas which show an average SEER 11 for houses built in 1999.
[25] Based on the regulation effective ….
[26] The number of projected new housing units uses the published values for the new housing units in 2006. A vacancy rate of 0% was assumed for 2007 calculations, based on information suggested by the Real Estate Center at Texas A&M University.
[27] In the 2005 report, the peak Ozone Season Day (OSD) was used to report peak savings. This is different than the peak day for 2004, which was August 19, 1999. This change was made at the request of the TCEQ. In the 2002 and 2003 reports, these dates represent the TMY2 non-coincident dates that were chosen by the DOE-2 simulation program as the peak date for the houses simulated in a specific county. Hence, the 2002 and 2003 dates did not correspond to the same calendar date.

represent counties that do not have power plants in eGRID's database. In Table 38 the PCA assignments for peak reductions are shown for each county; and in the peak OSD NOx reductions are shown calculated with eGRID.

Table 30: 1999 and IECC / IRC Code-compliant Building Characteristics used in the DOE-2 Simulation for Single-family Residential (1).

	County	Climate Zone	Division (East or West)	1999 Average Area %	1999 Average Glazing U-value (Btu/ hr-ft2-F)	1999 Average SHGC	1999 Average Roof Insulation (hr-ft2-F/Btu)	1999 Average Wall Insulation (hr-ft2-F/Btu)	2000 IECC Area %	2000 IECC Glazing U-value (Btu/ hr-ft2-F)	2000 IECC SHGC	2000 IECC Roof Insulation (hr-ft2-F/Btu)	2000 IECC Wall Insulation (hr-ft2-F/Btu)
Non-attainment	BRAZORIA	3	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	19.00	11.00
	CHAMBERS	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	COLLIN	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	DALLAS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	DENTON	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	EL PASO	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	FORT BEND	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	GALVESTON	3	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	19.00	11.00
	HARDIN	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	HARRIS	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	JEFFERSON	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	LIBERTY	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	MONTGOMERY	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	ORANGE	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	TARRANT	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	WALLER	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
Affected	BASTROP	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	BEXAR	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	CALDWELL	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	COMAL	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	ELLIS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	GREGG	6	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	GUADALUPE	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	HARRISON	6	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	HAYS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	HENDERSON	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	HOOD	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	HUNT	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	JOHNSON	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	KAUFMAN	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	NUECES	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	PARKER	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	ROCKWALL	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	RUSK	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	SAN PATRICIO	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	SMITH	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	TRAVIS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	UPSHUR	6	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	VICTORIA	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	WILLIAMSON	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	WILSON	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
ERCOT	ANDERSON	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	ANDREWS	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	ANGELINA	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	ARANSAS	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	ARCHER	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	ATASCOSA	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	AUSTIN	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	BANDERA	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	BAYLOR	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	BEE	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	BELL	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	BLANCO	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	BORDEN	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	BOSQUE	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	BRAZOS	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	BREWSTER	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	BRISCOE	8	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.41	0.40	38.00	19.00
	BROOKS	2	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.90	0.40	19.00	11.00
	BROWN	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	BURLESON	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	BURNET	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	CALHOUN	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	CALLAHAN	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	CAMERON	2	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.90	0.40	19.00	11.00
	CHEROKEE	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	CHILDRESS	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	CLAY	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	COKE	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	COLEMAN	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	COLORADO	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	COMANCHE	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	CONCHO	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	COOKE	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	CORYELL	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	COTTLE	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	CRANE	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	CROCKETT	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	CROSBY	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	CULBERSON	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	DAWSON	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	DE WITT	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	DELTA	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	DICKENS	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	DIMMIT	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	DUVAL	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	EASTLAND	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	ECTOR	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	EDWARDS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	ERATH	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	FALLS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	FANNIN	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	FAYETTE	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	FISHER	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	FOARD	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	FRANKLIN	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	FREESTONE	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00

Table 31: 1999 and IECC / IRC Code-compliant Building Characteristics used in the DOE-2 Simulation for Single-family Residential (2).

	County	Climate Zone	Division (East or West)	1999 Average Area %	1999 Average Glazing U-value (Btu/ hr-ft2-F)	1999 Average SHGC	1999 Average Roof Insulation (hr-ft2-F/Btu)	1999 Average Wall Insulation (hr-ft2-F/Btu)	2000 IECC Area %	2000 IECC Glazing U-value (Btu/ hr-ft2-F)	2000 IECC SHGC	2000 IECC Roof Insulation (hr-ft2-F/Btu)	2000 IECC Wall Insulation (hr-ft2-F/Btu)
	FRIO	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	GILLESPIE	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	GLASSCOCK	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	GOLIAD	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	GONZALES	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	GRAYSON	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	GRIMES	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	HALL	8	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.41	0.40	38.00	19.00
	HAMILTON	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	HARDEMAN	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	HASKELL	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	HIDALGO	2	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.90	0.40	19.00	11.00
	HILL	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	HOPKINS	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	HOUSTON	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	HOWARD	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	HUDSPETH	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	IRION	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	JACK	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	JACKSON	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	JEFF DAVIS	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	JIM HOGG	2	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	JIM WELLS	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	JONES	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	KARNES	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	KENDALL	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	KENEDY	2	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.90	0.40	19.00	11.00
	KENT	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	KERR	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	KIMBLE	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	KING	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	KINNEY	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	KLEBERG	2	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.90	0.40	19.00	11.00
	KNOX	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	LA SALLE	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	LAMAR	6	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	LAMPASAS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	LAVACA	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	LEE	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	LEON	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	LIMESTONE	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	LIVE OAK	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	LLANO	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	LOVING	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	MADISON	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	MARTIN	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	MASON	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	MATAGORDA	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	MAVERICK	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	MCCULLOCH	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	MCLENNAN	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	MCMULLEN	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
ERCOT	MEDINA	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	MENARD	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	MIDLAND	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	MILAM	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	MILLS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	MITCHELL	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	MONTAGUE	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	MOTLEY	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	NACOGDOCHES	5	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.65	0.40	30.00	13.00
	NAVARRO	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	NOLAN	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	PALO PINTO	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	PECOS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	PRESIDIO	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	RAINS	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	REAGAN	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	REAL	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	RED RIVER	6	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	REEVES	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	REFUGIO	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	ROBERTSON	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	RUNNELS	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	SAN SABA	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	SCHLEICHER	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	SCURRY	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	SHACKELFORD	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	SOMERVELL	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	STARR	2	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.90	0.40	19.00	11.00
	STEPHENS	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	STERLING	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	STONEWALL	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	SUTTON	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	TAYLOR	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	TERRELL	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	THROCKMORTON	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	TITUS	6	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	TOM GREEN	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	UPTON	5	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.50	0.40	38.00	13.00
	UVALDE	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	VAL VERDE	4	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.52	0.40	30.00	13.00
	VAN ZANDT	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	WARD	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	WASHINGTON	4	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.75	0.40	26.00	13.00
	WEBB	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	WHARTON	3	East Texas	13.8	1.11	0.71	27.08	14.18	13.8	0.75	0.40	19.00	11.00
	WICHITA	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	WILBARGER	7	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.45	0.40	38.00	19.00
	WILLACY	2	East Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.90	0.40	19.00	11.00
	WINKLER	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	WISE	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	YOUNG	6	West Texas	20.6	0.87	0.66	26.75	14.18	20.6	0.46	0.40	38.00	16.00
	ZAPATA	2	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00
	ZAVALA	3	West Texas	13.8	1.11	0.71	27.08	13.99	13.8	0.60	0.40	30.00	13.00

Table 32: 2007 Annual and Peak-day Electricity Savings from Implementation of the IECC / IRC for Single-family Residences Using 1999 Base Year (1).

2007 Summary

	County	Climate Zone	No. of Projected Units (2007)	Precode Total Annual Elec. Use (MWh/yr)	Code-compliant Total Annual Elec. Use (MWh/yr)	Precode OSD Elec. Use (MWh/day)	Code-compliant OSD Elec. Use (MWh/day)	Total Annual Elec. Savings (MWh/yr) w/ 7% of T&D Loss	Total OSD Elec. Savings (MWh/day) w/ 7% of T&D Loss	Precode Total NG Use (Therm/yr)	Code-compliant Total NG Use (Therm/yr)	Precode OSD NG Use (Therm/day)	Code-compliant OSD NG Use (Therm/day)	Total Annual NG Savings (Therm/yr)	Total OSD NG Savings (Therm/day)
Affected County	BASTROP	4	226	3,302	2,829	14.03	11.31	507	2.91	53,507	45,151	118.37	97.46	8,357	20.91
	BEXAR	4	9,219	122,684	106,853	508.83	415.92	16,939	99.40	2,529,134	2,162,617	5,351.11	4,420.73	366,517	930.38
	CALDWELL	4	84	1,197	1,023	5.12	4.13	187	1.06	21,697	18,482	47.99	39.51	3,215	8.48
	COMAL	4	2,477	32,963	28,710	136.71	111.75	4,551	26.71	679,538	581,061	1,437.76	1,187.78	98,477	249.98
	ELLIS	5	1,666	23,312	20,069	103.67	82.87	3,470	22.26	541,077	451,857	945.56	777.42	89,220	168.13
	GREGG	6	354	4,846	4,263	21.03	17.09	623	4.22	103,323	85,509	184.19	151.44	17,814	32.75
	GUADALUPE	4	1,406	18,711	16,296	77.60	63.43	2,583	15.16	385,721	329,823	816.10	674.21	55,898	141.89
	HARRISON	6	38	517	456	2.24	1.82	65	0.45	11,195	9,265	19.77	16.26	1,930	3.52
	HAYS	5	1,992	28,425	24,226	121.62	97.11	4,493	26.22	513,616	428,628	1,138.08	937.04	84,988	201.03
	HENDERSON	5	131	1,767	1,562	7.65	6.24	219	1.51	39,525	32,832	68.16	56.04	6,693	12.12
	HOOD	5	130	1,819	1,566	8.09	6.47	271	1.74	42,221	35,259	73.78	60.66	6,962	13.12
	HUNT	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	JOHNSON	5	1,086	15,196	13,082	67.58	54.02	2,262	14.51	352,707	294,548	616.37	506.77	58,159	109.60
	KAUFMAN	6	721	10,198	8,748	45.19	35.92	1,551	9.92	231,245	187,819	409.21	336.45	43,426	72.76
	NUECES	3	1,534	21,069	18,254	79.49	65.72	3,012	14.73	337,467	282,946	807.24	665.31	54,521	141.93
	PARKER	6	489	6,917	5,933	30.65	24.36	1,052	6.73	156,836	127,384	277.54	228.19	29,453	49.35
	ROCKWALL	6	1,190	16,832	14,439	74.59	59.29	2,560	16.37	381,667	309,993	675.40	555.30	71,674	120.09
	RUSK	5	8	101	90	0.41	0.34	11	0.08	2,458	2,100	4.42	3.68	357	0.74
	SAN PATRICIO	3	357	4,903	4,248	18.50	15.29	701	3.43	78,537	65,849	187.86	154.83	12,688	33.03
	SMITH	5	576	7,768	6,886	33.66	27.56	944	6.52	173,791	146,607	299.70	246.41	27,184	53.29
	TRAVIS	5	9,575	136,632	116,449	584.59	466.79	21,596	126.05	2,468,814	2,060,300	5,470.43	4,504.12	408,514	966.31
	UPSHUR	6	14	190	168	0.82	0.67	24	0.16	4,140	3,418	7.28	5.99	721	1.30
	VICTORIA	3	143	1,806	1,609	7.18	5.97	211	1.29	34,603	29,509	77.24	64.01	5,094	13.23
	WILLIAMSON	5	5,738	81,879	69,784	350.33	279.73	12,942	75.54	1,479,483	1,234,674	3,278.26	2,699.18	244,810	579.08
	WILSON	4	40	532	464	2.21	1.80	73	0.43	10,974	9,383	23.22	19.18	1,590	4.04
Nonattainment County	BRAZORIA	3	3,287	44,358	38,745	182.19	149.86	6,005	34.60	777,771	664,445	1,738.17	1,434.06	113,326	304.11
	CHAMBERS	4	368	4,951	4,319	19.87	16.28	676	3.84	86,664	72,780	197.42	163.37	13,884	34.05
	COLLIN	6	11,580	163,791	140,582	725.84	579.32	24,834	156.77	3,714,039	3,093,878	6,572.35	5,403.70	620,161	1,168.65
	DALLAS	5	9,941	139,103	119,752	618.57	494.46	20,705	132.80	3,228,598	2,696,225	5,642.12	4,638.87	532,373	1,003.25
	DENTON	6	3,157	44,654	38,306	197.88	157.28	6,792	43.44	1,012,541	822,394	1,791.79	1,473.18	190,147	318.60
	EL PASO	6	3,877	53,599	45,638	198.29	162.25	8,518	38.56	1,236,460	1,015,182	2,350.49	1,959.22	221,278	391.27
	FORT BEND	4	7,910	106,829	93,518	438.92	360.63	14,243	83.77	1,871,668	1,571,672	4,182.83	3,451.00	299,996	731.83
	GALVESTON	3	2,732	36,868	32,203	151.43	124.55	4,991	28.76	646,447	552,256	1,444.69	1,191.92	94,191	252.76
	HARDIN	4	129	1,737	1,515	6.97	5.71	238	1.35	30,380	25,513	69.20	57.27	4,867	11.94
	HARRIS	4	33,023	474,292	412,939	1,971	1,597	65,648	400.15	7,855,259	6,587,918	17,462.65	14,407.36	1,267,340	3,055.29
	JEFFERSON	4	540	7,276	6,343	29	24	998	5.65	127,170	106,797	289.69	239.72	20,373	49.96
	LIBERTY	4	293	3,962	3,466	16	13	530	3.11	69,330	58,217	154.94	127.83	11,112	27.11
	MONTGOMERY	4	7,417	100,170	87,689	411.56	338.16	13,355	78.55	1,755,014	1,473,716	3,922.13	3,235.91	281,298	686.22
	ORANGE	4	276	3,717	3,242	15	12	509	2.89	65,078	54,585	148.06	122.53	10,493	25.54
	TARRANT	5	13,507	189,001	162,709	840	672	28,133	180.44	4,386,749	3,663,405	7,666.04	6,302.91	723,343	1,363.13
	WALLER	4	90	1,215	1,064	4.99	4.10	162	0.95	21,296	17,882	47.59	39.27	3,413	8.33
ERCOT	ANDERSON	5	18	227	203	0.92	0.76	25	0.17	5,530	4,725	9.95	8.29	804	1.67
	ANDREWS	6	40	539	462	1.97	1.60	83	0.39	15,599	12,903	25.12	21.09	2,696	4.04
	ANGELINA	5	128	1,615	1,446	6.57	5.44	180	1.21	39,322	33,603	70.76	58.92	5,718	11.84
	ARANSAS	3	213	2,925	2,535	11.04	9.12	418	2.05	46,858	39,288	112.09	92.38	7,570	19.71
	ARCHER	7	21	296	252	1.19	0.94	47	0.27	9,406	7,570	12.70	10.58	1,836	2.12
	ATASCOSA	3	119	1,582	1,378	6.56	5.37	218	1.28	32,700	28,053	69.07	57.06	4,647	12.01
	AUSTIN	4	39	527	461	2.16	1.78	70	0.41	9,228	7,749	20.62	17.02	1,479	3.61
	BANDERA	5	2	27	23	0.11	0.09	4	0.02	548	455	1.16	0.96	93	0.20
	BAYLOR	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	BEE	3	16	202	180	0.80	0.67	24	0.14	3,872	3,302	8.64	7.16	570	1.48
	BELL	5	2,514	34,730	29,649	146.05	115.45	5,437	32.75	875,785	742,666	1,511.47	1,257.76	133,120	253.71
	BLANCO	5	19	271	231	1.16	0.93	43	0.25	4,899	4,088	10.86	8.94	811	1.92
	BORDEN	7	19	252	221	0.85	0.71	34	0.15	8,587	6,863	11.36	9.60	1,724	1.76
	BOSQUE	5	8	111	94	0.46	0.37	17	0.10	2,787	2,363	4.81	4.00	424	0.81
	BRAZOS	4	882	11,912	10,428	48.94	40.21	1,588	9.34	208,699	175,248	466.40	384.80	33,451	81.60
	BREWSTER	5	7	95	82	0.36	0.29	14	0.07	2,908	2,499	4.24	3.54	409	0.71
	BRISCOE	8	7	91	79	0.30	0.25	12	0.05	4,336	3,368	4.71	4.01	968	0.71
	BROOKS	2	3	42	36	0.15	0.13	6	0.03	663	562	1.57	1.29	101	0.28
	BROWN	5	182	2,514	2,146	10.57	8.36	394	2.37	63,402	53,765	109.42	91.05	9,637	18.37
	BURLESON	4	14	189	166	0.78	0.64	25	0.15	3,313	2,782	7.40	6.11	531	1.30
	BURNET	5	796	11,359	9,681	48.60	38.81	1,795	10.48	205,240	171,279	454.77	374.44	33,961	80.33
	CALHOUN	3	96	1,212	1,080	4.82	4.01	142	0.87	23,230	19,810	51.85	42.97	3,420	8.88
	CALLAHAN	6	12	167	142	0.65	0.52	26	0.14	4,762	3,928	7.34	6.13	833	1.21
	CAMERON	2	2,852	39,533	34,152	147.02	121.26	5,758	27.56	630,527	534,300	1,492.02	1,228.15	96,227	263.87
	CHEROKEE	5	25	315	283	1.28	1.06	35	0.24	7,680	6,563	13.82	11.51	1,117	2.31
	CHILDRESS	7	3	40	35	0.13	0.11	5	0.02	1,356	1,084	1.79	1.52	272	0.28
	CLAY	7	4	56	48	0.23	0.18	9	0.05	1,792	1,442	2.42	2.02	350	0.40
	COKE	6	1	14	12	0.05	0.04	2	0.01	407	338	0.61	0.51	70	0.10
	COLEMAN	5	2	27	23	0.11	0.09	4	0.02	810	691	1.22	1.02	120	0.20
	COLORADO	4	9	122	106	0.50	0.41	16	0.10	2,130	1,788	4.76	3.93	341	0.83
	COMANCHE	5	1	14	12	0.06	0.05	2	0.01	348	295	0.60	0.50	53	0.10
	CONCHO	5	1	14	12	0.05	0.04	2	0.01	415	357	0.61	0.51	58	0.10
	COOKE	6	26	367	315	1.63	1.30	55	0.35	8,361	6,958	14.76	12.13	1,402	2.62
	CORYELL	5	267	3,689	3,149	15.51	12.26	577	3.48	93,013	78,875	160.53	133.58	14,138	26.95
	COTTLE	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	CRANE	5	19	253	218	0.92	0.75	38	0.19	7,564	6,499	11.93	10.02	1,065	1.92
	CROCKETT	5	19	258	222	0.98	0.79	39	0.20	7,894	6,782	11.52	9.60	1,111	1.92
	CROSBY	7	14	186	163	0.63	0.52	25	0.11	6,327	5,057	8.37	7.08	1,270	1.30
	CULBERSON	6	2	28	24	0.10	0.08	4	0.02	639	524	1.21	1.01	114	0.20
	DAWSON	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	DE WITT	3	6	76	68	0.30	0.25	9	0.05	1,452	1,238	3.24	2.69	214	0.56
	DELTA	6	11	156	134	0.69	0.55	24	0.15	3,528	2,939	6.24	5.13	589	1.11
	DICKENS	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	DIMMIT	3	7	102	86	0.39	0.31	17	0.08	1,687	1,420	4.02	3.31	267	0.71
	DUVAL	3	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	EASTLAND	6	1	14	12	0.05	0.04	2	0.01	397	327	0.61	0.51	69	0.10
	ECTOR	6	261	3,519	3,015	12.87	10.46	540	2.57	101,784	84,190	163.93	137.59	17,594	26.34
	EDWARDS	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	ERATH	6	28	389	332	1.51	1.21	61	0.32	11,110	9,166	17.13	14.31	1,944	2.83
	FALLS	5	9	124	106	0.52	0.41	19	0.12	3,135	2,659	5.41	4.50	477	0.91
	FANNIN	6	33	466	400	2.06	1.65	70	0.44	10,612	8,832	18.73	15.40	1,780	3.33
	FAYETTE	4	20	270	236	1.11	0.91	36	0.21	4,732	3,974	10.58	8.73	759	1.85
	FISHER	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	FOARD	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	FRANKLIN	6	4	57	49	0.25	0.20	9	0.05	1,283	1,069	2.27	1.87	214	0.40
	FREESTONE	5	26	359	307	1.51	1.19	56	0.34	9,057	7,681	15.63	13.01	1,377	2.62
	FRIO	3	20	266	232	1.10	0.90	37	0.21	5,496	4,715	11.61	9.59	781	2.02

Table 33: 2007 Annual and Peak-day Electricity Savings from Implementation of the IECC / IRC for Single-family Residences Using 1999 Base Year (2).

2007 Summary															
	County	Climate Zone	No. of Projected Units (2007)	Precode Total Annual Elec. Use (MWh/yr)	Code-compliant Total Annual Elec. Use (MWh/yr)	Precode OSD Elec. Use (MWh/day)	Code-compliant OSD Elec. Use (MWh/day)	Total Annual Elec. Savings (MWh/yr) w/ 7% of T&D Loss	Total OSD Elec. Savings (MWh/day) w/ 7% of T&D Loss	Precode Total NG Use (Therm/yr)	Code-compliant Total NG Use (Therm/yr)	Precode OSD NG Use (Therm/day)	Code-compliant OSD NG Use (Therm/day)	Total Annual NG Savings (Therm/yr)	Total OSD NG Savings (Therm/day)
	GILLESPIE	5	76	1,084	924	4.64	3.71	171	1.00	19,596	16,353	43.42	35.75	3,243	7.67
	GLASSCOCK	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	GOLIAD	3	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	GONZALES	4	8	106	93	0.44	0.36	15	0.09	2,195	1,877	4.64	3.84	318	0.81
	GRAYSON	6	355	5,010	4,303	22.19	17.72	756	4.78	114,154	95,007	201.48	165.66	19,148	35.83
	GRIMES	4	38	513	449	2.11	1.73	68	0.40	8,992	7,550	20.09	16.58	1,441	3.52
	HALL	8	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	HAMILTON	5	2	28	24	0.12	0.09	4	0.03	697	591	1.20	1.00	106	0.20
	HARDEMAN	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	HASKELL	6	2	28	24	0.11	0.09	4	0.02	794	655	1.22	1.02	139	0.20
	HIDALGO	2	6,870	95,230	82,266	354.14	292.09	13,871	66.39	1,518,836	1,287,040	3,594.02	2,958.41	231,796	635.61
	HILL	5	28	387	330	1.63	1.29	61	0.36	9,754	8,272	16.83	14.01	1,483	2.83
	HOPKINS	6	14	198	170	0.88	0.70	30	0.19	4,490	3,740	7.95	6.53	750	1.41
	HOUSTON	5	7	88	79	0.36	0.30	10	0.07	2,150	1,838	3.87	3.22	313	0.65
	HOWARD	6	2	27	23	0.10	0.08	4	0.02	780	645	1.26	1.05	135	0.20
	HUDSPETH	6	127	1,752	1,493	6.48	5.30	278	1.26	40,551	33,303	77.00	64.18	7,248	12.82
	IRION	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	JACK	6	4	56	47	0.22	0.17	9	0.05	1,587	1,309	2.45	2.04	278	0.40
	JACKSON	3	21	265	236	1.05	0.88	31	0.19	5,082	4,334	11.34	9.40	748	1.94
	JEFF DAVIS	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	JIM HOGG	2	0	16,444	16,123	67.62	63.85	343	4.03	215,577	173,161	379.61	312.11	42,416	67.50
	JIM WELLS	3	57	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	JONES	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	KARNES	3	8	105	91	0.43	0.35	15	0.08	2,117	1,807	4.71	3.91	310	0.81
	KENDALL	5	547	7,286	6,327	30.22	24.51	1,027	6.11	149,850	124,494	317.50	262.30	25,356	55.20
	KENEDY	2	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	KENT	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	KERR	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	KIMBLE	5	1	14	12	0.05	0.04	2	0.01	415	357	0.61	0.51	58	0.10
	KING	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	KINNEY	4	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	KLEBERG	2	40	549	475	2.07	1.71	79	0.38	8,798	7,435	21.05	17.35	1,363	3.70
	KNOX	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	LA SALLE	3	39	568	479	2.15	1.74	96	0.44	9,399	7,911	22.39	18.45	1,488	3.94
	LAMAR	6	62	842	743	3.64	2.97	106	0.72	18,276	15,098	32.26	26.52	3,178	5.74
	LAMPASAS	5	27	373	318	1.57	1.24	58	0.35	9,406	7,976	16.23	13.51	1,430	2.72
	LAVACA	4	15	189	169	0.75	0.63	22	0.14	3,620	3,028	8.10	6.71	593	1.39
	LEE	4	19	271	231	1.16	0.93	42	0.24	4,908	4,180	10.86	8.94	727	1.92
	LEON	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	LIMESTONE	5	3	41	35	0.17	0.14	6	0.04	1,045	886	1.80	1.50	159	0.30
	LIVE OAK	3	16	220	190	0.83	0.69	31	0.15	3,520	2,951	8.42	6.94	569	1.48
	LLANO	5	294	4,195	3,576	17.95	14.33	663	3.87	75,805	63,261	167.97	138.30	12,543	29.67
	LOVING	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	MADISON	4	12	162	142	0.67	0.55	22	0.13	2,839	2,384	6.35	5.24	455	1.11
	MARTIN	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	MASON	5	12	171	146	0.73	0.59	27	0.16	3,094	2,582	6.86	5.64	512	1.21
	MATAGORDA	3	107	1,351	1,204	5.37	4.47	158	0.96	25,892	22,080	57.79	47.89	3,811	9.90
	MAVERICK	3	168	2,448	2,064	9.27	7.49	411	1.90	40,487	34,076	96.43	79.48	6,410	16.95
	MCCULLOCH	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	MCLENNAN	5	958	13,234	11,298	55.66	43.99	2,072	12.48	333,732	283,005	575.97	479.29	50,727	96.68
	MCMULLEN	3	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
ERCOT	MEDINA	4	31	413	359	1.71	1.40	57	0.33	8,505	7,272	17.99	14.87	1,232	3.13
	MENARD	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	MIDLAND	6	470	6,337	5,429	23.17	18.84	972	4.63	183,289	151,606	295.20	247.77	31,683	47.43
	MILAM	4	11	156	133	0.65	0.52	25	0.14	2,856	2,430	6.34	5.23	426	1.11
	MILLS	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	MITCHELL	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	MONTAGUE	6	1	14	12	0.06	0.05	2	0.01	322	268	0.57	0.47	54	0.10
	MOTLEY	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	NACOGDOCHE	5	52	656	588	2.67	2.21	73	0.49	15,974	13,651	28.75	23.94	2,323	4.81
	NAVARRO	5	47	649	554	2.73	2.16	102	0.61	16,373	13,884	28.26	23.51	2,489	4.74
	NOLAN	6	1	14	12	0.05	0.04	2	0.01	397	327	0.61	0.51	69	0.10
	PALO PINTO	6	15	208	178	0.81	0.65	33	0.17	5,952	4,910	9.18	7.66	1,042	1.51
	PECOS	5	6	81	70	0.31	0.25	12	0.06	2,493	2,142	3.64	3.03	351	0.61
	PRESIDIO	5	32	434	374	1.65	1.34	65	0.34	13,295	11,423	19.40	16.17	1,872	3.23
	RAINS	6	2	28	24	0.13	0.10	4	0.03	641	534	1.14	0.93	107	0.20
	REAGAN	5	3	40	34	0.15	0.12	6	0.03	1,194	1,026	1.88	1.58	168	0.30
	REAL	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	RED RIVER	6	3	41	36	0.18	0.14	5	0.03	884	731	1.56	1.28	154	0.28
	REEVES	6	2	27	23	0.10	0.08	4	0.02	780	645	1.26	1.05	135	0.20
	REFUGIO	3	7	88	79	0.35	0.29	10	0.06	1,694	1,445	3.78	3.13	249	0.65
	ROBERTSON	4	23	311	272	1.28	1.05	41	0.24	5,442	4,570	12.16	10.03	872	2.13
	RUNNELS	5	2	27	23	0.10	0.08	4	0.02	831	714	1.21	1.01	117	0.20
	SAN SABA	5	3	43	36	0.18	0.15	7	0.04	774	646	1.71	1.41	128	0.30
	SCHLEICHER	5	2	27	23	0.10	0.08	4	0.02	831	714	1.21	1.01	117	0.20
	SCURRY	7	10	133	116	0.45	0.37	18	0.08	4,520	3,612	5.98	5.05	907	0.93
	SHACKELFOR	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	SOMERVELL	5	70	979	843	4.36	3.48	146	0.94	22,734	18,986	39.73	32.66	3,749	7.06
	STARR	2	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	STEPHENS	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	STERLING	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	STONEWALL	7	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	SUTTON	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	TAYLOR	6	321	4,459	3,802	17.31	13.88	702	3.67	127,372	105,080	196.41	164.02	22,292	32.40
	TERRELL	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	THROCKMORT	6	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	TITUS	6	32	435	384	1.88	1.53	55	0.37	9,433	7,792	16.65	13.69	1,640	2.96
	TOM GREEN	5	369	5,009	4,310	19.07	15.41	748	3.92	153,303	131,718	223.69	186.45	21,585	37.24
	UPTON	5	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	UVALDE	4	37	492	429	2.04	1.67	68	0.40	10,151	8,680	21.48	17.74	1,471	3.73
	VAL VERDE	4	155	2,063	1,797	8.55	6.99	285	1.67	42,523	36,360	89.97	74.33	6,162	15.64
	VAN ZANDT	6	50	707	607	3.13	2.50	107	0.68	16,036	13,359	28.38	23.33	2,678	5.05
	WARD	6	6	81	69	0.30	0.24	12	0.06	2,340	1,935	3.77	3.16	404	0.61
	WASHINGTON	4	80	1,080	946	4.44	3.65	144	0.85	18,930	15,896	42.30	34.90	3,034	7.40
	WEBB	3	1,941	28,284	23,841	107.08	86.54	4,754	21.97	467,766	393,703	1,114.15	918.26	74,063	195.89
	WHARTON	3	146	1,844	1,643	7.33	6.10	215	1.32	35,329	30,128	78.86	65.35	5,201	13.51
	WICHITA	7	303	4,272	3,638	17.21	13.59	678	3.87	135,715	109,230	183.25	152.67	26,484	30.58
	WILBARGER	7	4	56	48	0.23	0.18	9	0.05	1,792	1,442	2.42	2.02	350	0.40
	WILLACY	2	42	582	503	2.17	1.79	85	0.41	9,285	7,868	21.97	18.09	1,417	3.89
	WINKLER	6	7	94	81	0.35	0.28	14	0.07	2,730	2,258	4.40	3.69	472	0.71
	WISE	6	116	1,641	1,408	7.27	5.80	249	1.57	37,205	30,992	65.84	54.13	6,212	11.71
	YOUNG	6	11	153	130	0.59	0.48	24	0.13	4,365	3,601	6.73	5.62	764	1.11
	ZAPATA	2	0	0	0	0.00	0.00	0	0.00	0	0	0.00	0.00	0	0.00
	ZAVALA	3	3	44	37	0.17	0.13	7	0.03	723	609	1.72	1.42	114	0.30
	TOTAL		160,502					325,483	1,929					7,136,275	15,660

Table 34: 2007 Allocation of PCA for each of 41 Non-attainment and Affected Counties, and ERCOT Counties (1).

County	Elec. Utilities 1	PCA	1998 Annual net Generation (MWh)	Percentage	Elec. Utilities 2	PCA	1998 Annual net Generation (MWh)	Percentage
ANDERSON	ONCOR	TXU Electric/PCA	97581030	100%	Trinity Valley EC			0%
ANDREWS	ONCOR	TXU Electric/PCA	97581030	100%	Cap Rock EC			0%
ANGELINA	ONCOR	TXU Electric/PCA	97581030	100%	Sam Houston EC			0%
ARANSAS	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	San Patricio EC			0%
ARCHER	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
ATASCOSA	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	54%	CPSB	San Antonio Public Service Bd/PCA	14,641,059	46%
AUSTIN	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	100%	Bellville			0%
BANDERA*	Bandera EC							
BASTROP	ONCOR	TXU Electric/PCA	97581030	100%	Smithville			0%
BAYLOR	ONCOR	TXU Electric/PCA	97581030	100%	Seymour			0%
BEE	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	San Patricio EC			0%
BELL	ONCOR	TXU Electric/PCA	97581030	100%	Bartlett EC			0%
BEXAR	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	Bandera EC			0%
BLANCO*	Pedernales EC				Central Texas EC			
BORDEN*	Lyntegar EC				Big Country EC			
BOSQUE	T-NMP	Texas-New Mexico Power Co/PCA	2067714	100%	United Coop Services			0%
BRAZORIA	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	97%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	3%
BRAZOS*	BRYAN				College Station			
BREWSTER	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
BRISCOE	XCEL(SPS)				WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%
BROOKS	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%
BROWN	ONCOR	TXU Electric/PCA	97581030	85%	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	15%
BURLESON	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	BRYAN			0%
BURNET	ONCOR	TXU Electric/PCA	97581030	100%	Pedernales EC			0%
CALDWELL	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Luling			0%
CALHOUN	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Victoria EC			0%
CALLAHAN	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Taylor EC			0%
CAMERON	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Magic Valley EC			0%
CHAMBERS	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%	ENTERGY	Entergy Electric System/PCA	32,288,113	30%
CHEROKEE	ONCOR	TXU Electric/PCA	97581030	100%	Cherokee County EC			0%
CHILDRESS	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Greenbelt EC			0%
CLAY	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
COKE	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Concho Valley EC			0%
COLEMAN	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Coleman			0%
COLLIN	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
COLORADO	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Weimar			0%
COMAL	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	New Braunfels			0%
COMANCHE	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
CONCHO	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Concho Valley EC			0%
COOKE	ONCOR	TXU Electric/PCA	97581030	100%	Cooke County EC			0%
CORYELL	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
COTTLE	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	South Plains EC			0%
CRANE	ONCOR	TXU Electric/PCA	97581030	100%				0%
CROCKETT	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
CROSBY*	XCEL(SPS)				Crosbyton			
CULBERSON	EPEC	El Paso Electric Co/PCA	3066882	100%	Rio Grande EC			0%
DALLAS	ONCOR	TXU Electric/PCA	97581030	100%	Garland			0%
DAWSON	ONCOR	TXU Electric/PCA	97581030	100%	Lyntegar EC			0%
DELTA	ONCOR	TXU Electric/PCA	97581030	100%	Lamar County EC			0%
DENTON	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
DEWITT	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Yoakum			0%
DICKENS	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	South Plains EC			0%
DIMMIT	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%
DUVAL	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%
EASTLAND	ONCOR	TXU Electric/PCA	97581030	85%	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	15%
ECTOR	ONCOR	TXU Electric/PCA	97581030	100%	Goldsmith			0%
EDWARDS	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
ELLIS	ONCOR	TXU Electric/PCA	97581030	100%	Navarro County EC			0%
ERATH	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
FALLS	ONCOR	TXU Electric/PCA	97581030	100%	Belfalls EC			0%
FANNIN	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
FAYETTE*	La Grange				Schulenburg			
FISHER	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Big Country EC			0%
FOARD*	XCEL(SPS)				Floydada			
FORT BEND	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	100%				0%
FRANKLIN	SWEPCO(AEP)	Southwestern Public Service Co/PCA			FEC Electric			
FREESTONE	ONCOR	TXU Electric/PCA	97581030	100%	Navasota Valley EC			0%
FRIO	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%
GALVESTON	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	97%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	3%
GILLESPIE*	Fredericksburg				Pedernales EC			
GLASSCOCK	ONCOR	TXU Electric/PCA	97581030	100%	Cap Rock EC			0%
GOLIAD	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Karnes EC			0%
GONZALES	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Gonzales			0%
GRAYSON	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
GRIMES	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	Mid-South EC			0%
GUADALUPE	CPSB	San Antonio Public Service Bd/PCA	14,641,059	100%	Seguin			0%
HALL	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Lighthouse EC			0%
HAMILTON	T-NMP	Texas-New Mexico Power Co/PCA	2067714	100%	United Coop Services			0%
HARDEMAN	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	South Plains EC			0%
HARRIS	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%	ENTERGY	Entergy Electric System/PCA	32,288,113	30%
HASKELL	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Big Country EC			0%
HAYS	San Marcos	Lower Colorado River Authority/PCA		100%	Pedernales EC			0%
HENDERSON	ONCOR	TXU Electric/PCA	97581030	100%	Trinity Valley EC			0%
HIDALGO	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Magic Valley EC			0%
HILL	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
HOOD	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
HOPKINS	ONCOR	TXU Electric/PCA	97581030	100%	SWEPCO(AEP)			0%
HOUSTON	ONCOR	TXU Electric/PCA	97581030	100%	Houston County EC			0%
HOWARD	ONCOR	TXU Electric/PCA	97581030	100%	Cap Rock EC			0%
HUDSPETH	EPEC	El Paso Electric Co/PCA	3066882	100%	Rio Grande EC			0%
HUNT	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
IRION	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Cap Rock EC			0%
JACK	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
JACKSON	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Jackson EC			0%
JEFF DAVIS	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
JIM HOGG	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%
JIM WELLS	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Nueces EC			0%
JOHNSON	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
JONES	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Taylor EC			0%
KARNES	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Floresville			0%

Table 35: 2006 Allocation of PCA for each of 41 Non-attainment and Affected Counties, and ERCOT Counties (2).

County	Elec. Utilities 1	PCA	1998 Annual net Generation (MWh)	Percentage	Elec. Utilities 2	PCA	1998 Annual net Generation (MWh)	Percentage
KAUFMAN	ONCOR	TXU Electric/PCA	97581030	100%	Trinity Valley EC			0%
KENDALL*	Boerne				Central Texas EC			
KENEDY*	Nueces EC				Magic Valley EC			
KENT	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	South Plains EC			0%
KERR*	Kerrville				Bandera EC			
KIMBLE	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Central Texas EC			0%
KING	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	South Plains EC			0%
KINNEY	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
KLEBERG	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Nueces EC			0%
KNOX	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Tri-County EC			0%
LA SALLE	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%
LAMAR	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
LAMPASAS	ONCOR	TXU Electric/PCA	97581030	100%	Lampasas			0%
LAVACA*	Schulenburg				Yoakum			
LEE*	Giddings				Lexington			
LEON	ONCOR	TXU Electric/PCA	97581030	75%	ENTERGY	Entergy Electric System/PCA	32,288,113	25%
LIMESTONE	ONCOR	TXU Electric/PCA	97581030	75%	ENTERGY	Entergy Electric System/PCA	32,288,113	25%
LIVE OAK	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	San Patricio EC			0%
LLANO*	Llano				Pedernales EC			
LOVING	ONCOR	TXU Electric/PCA	97581030	100%				0%
MADISON	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	Houston County EC			0%
MARTIN	ONCOR	TXU Electric/PCA	97581030	100%	Cap Rock EC			0%
MASON*	Mason				Cap Rock EC			
MATAGORDA	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	19%	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	81%
MAVERICK	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
McCULLOCH	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Brady			0%
McLENNAN	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
McMULLEN	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Karnes EC			0%
MEDINA	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	54%	CPSB	San Antonio Public Service Bd/PCA	14,641,059	46%
MENARD	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Cap Rock EC			0%
MIDLAND	ONCOR	TXU Electric/PCA	97581030	100%	Cap Rock EC			0%
MILAM	ONCOR	TXU Electric/PCA	97581030	75%	ENTERGY	Entergy Electric System/PCA	32,288,113	25%
MILLS*	Goldwaithe				Cap Rock EC			
MITCHELL	ONCOR	TXU Electric/PCA	97581030	100%	Cap Rock EC			0%
MONTAGUE	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
MONTGOMERY	ENTERGY	Entergy Electric System/PCA	32,288,113	30%	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	70%
MOTLEY	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Lighthouse EC			0%
NACOGDOCHES	ONCOR	TXU Electric/PCA	97581030	100%	Cherokee County EC			0%
NAVARRO	ONCOR	TXU Electric/PCA	97581030	100%	Navarro County EC			0%
NOLAN	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	15%	ONCOR	TXU Electric/PCA	97,581,030	85%
NUECES	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Robstown			0%
PALO PINTO	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
PARKER	ONCOR	TXU Electric/PCA	97581030	100%	Weatherford			0%
PECOS	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	15%	ONCOR	TXU Electric/PCA	97,581,030	85%
PRESIDIO	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
RAINS	T-NMP	Texas-New Mexico Power Co/PCA	2067714	100%	FEC Electric			0%
REAGAN	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Cap Rock EC			0%
REAL	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Bandera EC			0%
RED RIVER	ONCOR	TXU Electric/PCA	97581030	100%	SWEPCO(AEP)			0%
REEVES	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	15%	ONCOR	TXU Electric/PCA	97,581,030	85%
REFUGIO	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	San Patricio EC			0%
ROBERTSON	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	Hearne			0%
ROCKWALL	ONCOR	TXU Electric/PCA	97581030	100%	FEC Electric			0%
RUNNELS	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Coleman County EC			0%
RUSK	SWEPCO(AEP)	Southwestern Public Service Co/PCA		0%	ONCOR	TXU Electric/PCA	97,581,030	100%
SAN PATRICIO	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	San Patricio EC			0%
SAN SABA*	San Saba				Central Texas EC			
SCHLEICHER	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Pedernales EC			0%
SCURRY	ONCOR	TXU Electric/PCA	97581030	100%	Cap Rock EC			0%
SHACKELFORD	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Fort Belknap EC			0%
SMITH	ONCOR	TXU Electric/PCA	97581030	100%	SWEPCO(AEP)			0%
SOMERVELL	T-NMP	Texas-New Mexico Power Co/PCA	2067714	100%	United Coop Services			0%
STARR	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%
STEPHENS	ONCOR	TXU Electric/PCA	97581030	100%	Comanche EC			0%
STERLING	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Cap Rock EC			0%
STONEWALL	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Big Country EC			0%
SUTTON	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Pedernales EC			0%
TARRANT	ONCOR	TXU Electric/PCA	97581030	100%	Tri-County EC			0%
TAYLOR	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Taylor EC			0%
TERRELL	T-NMP	Texas-New Mexico Power Co/PCA	2067714	100%	Rio Grande EC			0%
THROCKMORTON	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Fort Belknap EC			0%
TITUS	SWEPCO(AEP)	Southwestern Public Service Co/PCA		0%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	100%
TOM GREEN	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Concho Valley EC			0%
TRAVIS	ONCOR	TXU Electric/PCA	97581030	97%	Austin Energy	Austin Energy/PCA	3,359,240	3%
UPTON	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	15%	ONCOR	TXU Electric/PCA	97,581,030	85%
UVALDE	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Bandera EC			0%
VAL VERDE	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
VAN ZANDT	ONCOR	TXU Electric/PCA	97581030	100%	SWEPCO(AEP)			0%
VICTORIA	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Victoria EC			0%
WALLER	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	100%	Hempstead			0%
WARD	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
WASHINGTON	ENTERGY	Entergy Electric System/PCA	32,288,113	100%	Bluebonnet EC			0%
WEBB	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Rio Grande EC			0%
WHARTON	RELIANT(CENTER POINT)	Reliant Energy HL&P/PCA	74,386,176	81%	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17162569	19%
WICHITA	ONCOR	TXU Electric/PCA	97581030	100%	Electra			0%
WILBARGER	WTU(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Vernon			0%
WILLACY	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Magic Valley EC			0%
WILLIAMSON	ONCOR	TXU Electric/PCA	97581030	97%	Austin Energy	Austin Energy/PCA	3,359,240	3%
WILSON	Floresville	San Antonio Public Service Bd/PCA		100%	Guadalupe Valley EC			
WINKLER	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
WISE	ONCOR	TXU Electric/PCA	97581030	100%	Bridgeport			0%
YOUNG	ONCOR	TXU Electric/PCA	97581030	98%	T-NMP	Texas-New Mexico Power Co/PCA	2,067,714	2%
ZAPATA	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%
ZAVALA	CPL(AEP)	American Electric Power - West (ERCOT)/PCA	17,162,569	100%	Medina EC			0%

Table 36: 2007 Totalized Annual Electricity Savings from IECC / IRC by PCA for Single-family Residences Using 1999 Base Year.

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West (ERCOT)/PCA	32,950.72
Austin Energy/PCA	1,192.30
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	4,631.94
Reliant Energy HL&P/PCA	82,244.81
San Antonio Public Service Bd /PCA	24,443.43
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	1,431.04
TXU Electric/PCA	141,958.65
El Paso Electric Co/PCA	317.38
Entergy Electric System/PCA	24,799.04
Total	313,969.30

Table 37: 2007 Annual NOx Reductions from IECC / IRC by PCA for Single-family Residences by County Using 2007 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00883113	290.992191	0.010890729	12.9850148	0.006522185	0	0.003944232	18.26943725	0.0654443	5382.453255	0.014877	363.655522	0.006262	0	0.0048171	0	0.121275	173.549063	0.00816387	1158.93195	7400.836434	3.700418217
	Chambers	0.02176222	717.080952	0.026955801	32.1393982	0.016072371	0	0.009076193	42.04036329	0.1649402	13565.47729	0.037472	915.95142	0.015056	0	0.0095532	0	0.011519	16.48353661	0.01581859	2245.585953	17534.75891	8.767379457
	Fort Bend	0.07043123	2320.76006	0.087239726	104.015915	0.052016606	0	0.029374182	136.0593887	0.5338124	43903.29683	0.121275	2964.38424	0.048726	0	0.030918	0	0.037279	53.34730102	0.05119528	7267.612082	56749.47581	28.37473791
	Galveston	0.03385674	1115.60403	0.041710519	49.7314464	0.025004711	0	0.015351589	71.10760661	0.2495874	20527.26626	0.056747	1387.09261	0.024143	0	0.0192972	0	0.567751	812.4735304	0.03283689	4661.479972	28624.75545	14.31237773
	Harris	0.06826733	2249.45795	0.084559408	100.820172	0.050418468	0	0.028471701	131.879154	0.5174117	42554.42934	0.117549	2873.30767	0.047229	0	0.0299681	0	0.036133	51.70827969	0.04962237	7044.32485	55005.92742	27.50296371
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00203914	67.190977	0.003716345	4.43099727	0.001505992	0	0.005950953	27.56444377	0.0024815	204.0886992	0.000717	17.5271799	0.019166	0	0.0766809	0	0.000864	1.237003707	0.0040002	567.8628782	889.9021791	0.44495109
	Dallas	0.00453947	149.578855	0.004683963	5.58468807	0.003352602	0	0.00774211	35.86097303	0.0020856	171.5306945	0.000681	16.6474508	0.007503	0	0.026717	0	0.007525	10.76846467	0.04037045	5730.934979	6120.906105	3.060453053
	Denton	0.00047388	15.6146982	0.000872802	1.04064115	0.000349982	0	0.001396994	6.470788821	0.0005854	48.1496772	0.000169	4.13021906	0.004544	0	0.0181872	0	0.000187	0.26703954	0.00084941	120.5804384	196.2535023	0.098126751
	Tarrant	0.01216249	400.762913	0.012266309	14.6251192	0.008982543	0	0.020308652	94.0684171	0.0053165	437.2548966	0.001753	42.8372606	0.017326	0	0.0602168	0	0.020603	29.48431043	0.11064724	15707.33194	16726.36486	8.36318243
	Ellis	0.00327981	108.072227	0.003307809	3.94390086	0.002422289	0	0.005476558	25.36707602	0.0014337	117.9128824	0.000473	11.5517629	0.004672	0	0.0162384	0	0.005556	7.950923029	0.02983782	4235.737091	4510.535862	2.255267931
	Johnson	0.00028606	9.42583369	0.000526868	0.62818444	0.000211267	0	0.000843297	3.906100434	0.0003534	29.06561784	0.000102	2.49321233	0.002743	0	0.0109787	0	0.000113	0.16119878	0.00051274	72.78854494	118.4686924	0.059234346
	Kaufman	0.00632545	208.428233	0.006379446	7.60621218	0.004671629	0	0.010562096	48.92297485	0.002765	227.4069339	0.000911	22.2787444	0.009011	0	0.0313175	0	0.010715	15.3341602	0.05754527	8169.047905	8699.025163	4.349512581
	Parker	0.00021749	7.16643561	0.000400576	0.47760691	0.000160626	0	0.000641157	2.969797494	0.0002687	22.09850988	7.75E-05	1.89558252	0.002085	0	0.0083471	0	8.56E-05	0.122558992	0.00038984	55.34093196	90.07142337	0.045035712
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00081989	27.0161306	0.000826893	0.98590493	0.000605529	0	0.001369042	6.34131692	0.0003584	29.47611919	0.000118	2.88773484	0.001168	0	0.0040593	0	0.001389	1.987589059	0.00745892	1058.858785	1127.55358	0.56377679
	Hood	0.01252711	412.777326	0.012634039	15.0635636	0.009251829	0	0.020917482	96.88848053	0.0054759	450.3632977	0.001805	44.1214726	0.017846	0	0.062022	0	0.021221	30.36821629	0.11396431	16178.21977	17227.80212	8.613901062
	Hunt	0.00618756	203.88452	0.006240374	7.44039761	0.004569788	0	0.010331844	47.85645947	0.0027047	222.4494882	0.000892	21.7930703	0.008815	0	0.0306347	0	0.010482	14.99987722	0.05629078	7990.963574	8509.387387	4.254693693
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03341375	1101.00725	0.051775843	61.7323319	0.024677545	0	0.090663423	419.9473537	0.0011418	93.91051588	1.143572	27952.8167	0.046874	0	0.0046695	0	0.00052	0.743542017	0.00250387	355.44531	29985.60303	14.99280151
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200047	65.9168392	0.076378745	91.0663681	0.001477434	0	0.133848731	619.9790185	0.0012371	101.747748	0.003555	86.8914157	0.001062	0	0.0018557	0	0.000402	0.574874166	0.00183516	260.5175123	1226.693776	0.613346888
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00450233	148.355153	0.171901148	204.957719	0.003325174	0	0.301245466	1395.350314	0.0027843	228.9976722	0.008001	195.561399	0.00239	0	0.0041765	0	0.000904	1.293835476	0.0041303	586.3314428	2760.847535	1.380423767
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.0024586	81.012619	0.093870431	111.921704	0.001815785	0	0.164501762	761.96196	0.0015205	125.0492535	0.004369	106.790636	0.001305	0	0.0022807	0	0.000494	0.706527533	0.00225544	320.1792776	1507.621977	0.753810989
	Travis	0.00051001	16.8050997	0.299602906	357.216509	0.000376663	0	0.033939476	157.2055487	0.0003347	27.52806004	0.000906	22.1487059	0.000271	0	0.0004717	0	0.000103	0.147864667	0.00046734	66.34235294	647.3941406	0.32369707
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.00068596	22.6030373	0.00069182	0.82485705	0.000506616	0	0.001145408	5.305460842	0.0002999	24.66118601	9.88E-05	2.41602246	0.000977	0	0.0033962	0	0.001162	1.662915772	0.00624051	885.8938751	943.3673546	0.471683677
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	7498.55414	0.004556851	5.43313326	0.168069652	0	0.007612767	35.26186508	0.0016809	138.2443007	0.001627	39.7644746	0.046792	0	0.0072464	0	0.001609	2.3031496	0.00828339	1175.899495	8895.460561	4.447730281
	San Patricio	0.05031335	1657.86129	0.001007478	1.20121575	0.037158653	0	0.001683113	7.79607376	0.0003716	30.56454224	0.00036	8.79155927	0.010345	0	0.0016021	0	0.000356	0.509205175	0.00183138	259.9805534	1966.704441	0.983352221
Victoria Area	Victoria	0.02183674	719.536225	0.002215582	2.64163835	0.016127403	0	0.003612695	16.73378039	0.0011996	98.6626097	0.000555	13.5756074	0.525456	0	0.0324127	0	0.000477	0.682398076	0.00225485	320.0953336	1171.927592	0.585963796
Other ERCOT counties	Andrews	2.4742E-05	0.81526951	2.49533E-05	0.02975179	1.82731E-05	0	4.13138E-05	0.191362797	1.082E-05	0.889504921	3.57E-06	0.08714357	3.52E-05	0	0.0001225	0	4.19E-05	0.05997975	0.00022509	31.95332783	34.02634017	0.01701317
	Angelina	0.00031082	10.241741	0.000313473	0.37375385	0.000229554	0	0.000519	2.403975853	0.0001359	11.17431594	4.48E-05	1.09473236	0.000443	0	0.0015389	0	0.000527	0.753489561	0.00282766	401.4104613	427.4524699	0.213726235
	Bosque	0.00059539	19.6185892	0.001096604	1.30748036	0.000439723	0	0.001755208	8.130016125	0.0007356	60.49612541	0.000212	5.18928193	0.005709	0	0.0228507	0	0.000234	0.335513308	0.00106721	151.499444	246.5764504	0.123288225
	Brazos	0.00193973	63.9153475	0.003572622	4.25963666	0.001432574	0	0.005718288	26.48675703	0.0023964	197.0901596	0.000692	16.9061473	0.018599	0	0.0744451	0	0.000764	1.093067878	0.00347685	493.5696194	803.3207353	0.401660368
	Calhoun	0.08269981	2725.01847	0.001655986	1.97443243	0.061077496	0	0.002766524	12.81436819	0.0006108	50.23878813	0.000591	14.4506428	0.017004	0	0.0026334	0	0.000585	0.836978047	0.00301023	427.3287602	3232.662442	1.616331221
	Cameron	0.04837175	1593.88403	0.000968599	1.15486054	0.297964476	0	0.001618161	7.495221401	0.0003573	29.38504922	0.000346	8.45229089	0.009946	0	0.0015403	0	0.000342	0.489554825	0.00176071	249.9478414	1890.808845	0.945404422
	Cherokee	0.0035039	115.456001	0.003533808	4.2133584	0.002587786	0	0.00585073	27.10022047	0.0015316	125.9689964	0.000505	12.3410093	0.004992	0	0.0173479	0	0.005936	8.49415072	0.03187642	4525.133639	4818.707375	2.409353688
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.00129879	42.7959665	2.6007E-05	0.03100814	0.000959212	0	4.34478E-05	0.201247543	9.593E-06	0.788991897	9.28E-06	0.22694497	0.000267	0	4.136E-05	0	9.19E-06	0.013144602	4.7275E-05	6.711127825	50.76843144	0.025384216
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00353575	116.50544	0.003565928	4.25165578	0.002611307	0	0.005903911	27.34654827	0.0015456	127.1139932	0.000509	12.453183	0.005037	0	0.0175056	0	0.00599	8.571358412	0.03216616	4566.264899	4862.507078	2.431253539
	Fannin	0.00705631	232.51067	0.007116546	8.48505727	0.005211403	0	0.011782473	54.57568539	0.0030845	253.6822284	0.001017	24.8528989	0.010052	0	0.034936	0	0.011954	17.10591609	0.06419422	9112.924751	9704.137206	4.852068603
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00367718	121.165658	0.003708565	4.42172201	0.00271576	0	0.006140067	28.4404102	0.0016074	132.198553	0.00053	12.9513103	0.005238	0	0.0182058	0	0.006229	8.914212749	0.03345281	4748.915495	5057.007361	2.528503681
	Frio	0.00858833	282.991835	0.000871383	1.03894989	0.006342868	0	0.001420864	6.581354839	0.0004718	38.80376272	0.000218	5.33925314	0.206661	0	0.0127478	0	0.000188	0.268385492	0.00088683	125.8927106	460.9162514	0.230458126
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.18852746	6212.11594	0.003775086	4.50103488	0.139235931	0	0.006306735	29.21240416	0.0013925	114.5273619	0.001348	32.9425542	0.038764	0	0.0060032	0	0.001333	1.908025478	0.00686231	974.1643337	7369.371657	3.684685829
	Howard	0.00055511	18.2913762	0.000559851	0.66751076	0.000409976	0	0.000926915	4.29341325	0.0002427	19.95692098	8E-05	1.95515209	0.000791	0	0.0027484	0	0.00094	1.345704892	0.00505009	716.9044527	763.4145308	0.381707265
	Jack	0.00212145	69.9032642	0.002139557	2.55099347	0.001566784	0	0.003542346	16.40792896	0.0009273	76.26839594	0.000306	7.47190982	0.003022	0	0.0105033	0	0.003594	5.142815047	0.0192997	2739.75894	2917.504247	1.458752123
	Jones	0.04071872	1341.71133	0.000815354	0.97214694	0.030072592	0	0.001362147	6.309382171	0.0003008	24.73596118	0.000291	7.11503111	0.008372	0	0.0012966	0	0.000288	0.412101033	0.00148214	210.4029181	1591.658868	0.795829434
	Lamar	0.00095084	31.3307943	0.000958954	1.14336079	0.000702236	0	0.001587687	7.354069269	0.0004156	34.18366011	0.000137	3.34892615	0.001355	0	0.0047076	0	0.001611	2.305020834	0.00865017	1227.965886	1307.631717	0.653815859
	Limestone	0.00071976	23.7165062	0.000891528	1.06296818	0.000531572	0	0.000300183	1.390429541	0.0054552	448.660261	0.001239	30.2938846	0.000498	0	0.000316	0	0.000381	0.545171222	0.00052318	74.26979223	579.939013	0.289969506
	Llano	0.00123817	40.7987267	0.047274044	56.3648365	0.000914447	0	0.082844655	383.7313023	0.0007657	62.97599542	0.0022	53.7807814	0.000657	0	0.0011486	0	0.000249	0.355813997	0.00113586	161.2453345	759.2527909	0.379626395
	McLennan	0.02453432	808.423487	0.024743738	29.5019561	0.018119687	0	0.040966843	189.7558763	0.0107245	882.0355294	0.003535	86.4118073	0.034951	0	0.1214699	0	0.041562	59.47608491	0.22319886	31685.00788	33740.61262	16.87030631
	Milam	0.0022454	73.987715	0.002264571	2.70004813	0.001658332	0	0.003749326	17.36664497	0.0009815	80.72476168	0.000324	7.90849384	0.003199	0	0.011117	0	0.003804	5.443309957	0.02042738	2899.843175	3087.974149	1.543987074
	Mitchell	0.01494317	492.388211	0.015070721	17.9688191	0.011036196	0	0.024951762	115.5750147	0.006532	537.2232536	0.002153	52.631023	0.021288	0	0.073984	0	0.025314	36.22522538	0.1359442	19298.45506	20550.4666	10.2752333
	Nolan	0.00056465	18.6057477	0.000569473	0.67898318	0.000417022	0	0.000942846	4.367203584	0.0002468	20.29991798	8.14E-05	1.98875503	0.000804	0	0.0027956	0	0.000957	1.368833346	0.00513689	729.2257962	776.535237	0.388267618
	Palo Pinto	0.003207	105.672913	0.005906709	7.04256855	0.002368511	0	0.009454195	43.79124719	0.003962	325.8543085	0.001144	27.9513748	0.03075	0	0.1230821	0	0.001263	1.807197671	0.00574838	816.0315429	1328.151153	0.664075577
	Pecos	4.0968E-05	1.34991463	4.13174E-05	0.0492627	3.02565E-05	0	6.84069E-05	0.316856497	1.791E-05	1.472832848	5.9E-06	0.14429141	5.84E-05	0	0.0002028	0	6.94E-05	0.099313836	0.0003727	52.90798255	56.34045447	0.028170227
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00073771	24.308003	0.000835096	0.99568533	0.00054483	0	0.000735917	3.40872217	0.0031497	259.0446499	0.000731	17.8650995	0.000761	0	0.0018663	0	0.191633	274.2334024	0.00339774	482.3382004	1062.193763	0.531096881
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.00569644	187.701729	0.005745061	6.84983584	0.004207073	0	0.009511781	44.05798027	0.00249	204.7931516	0.000821	20.0633033	0.008115	0	0.0282032	0	0.00965	13.80930186	0.05182285	7356.702092	7833.977393	3.916988697
	Tom Green	0.00148245	48.8477348	2.96846E-05	0.03539299	0.001094854	0	4.95918E-05	0.229705914	1.095E-05	0.90056307	1.06E-05	0.25903721	0.000305	0	4.72E-05	0	1.05E-05	0.015003378	5.396E-05	7.660146961	57.94758436	0.028973792
	Upton	3.1166E-05	1.02694641	3.14322E-05	0.03747656	2.30176E-05	0	5.20405E-05	0.24104831	1.362E-05	1.120456337	4.49E-06	0.10976957	4.44E-05	0	0.0001543	0	5.28E-05	0.075552916	0.00028353	40.24970275	42.86095284	0.021430476
	Ward	0.01855953	611.549883	0.01871795	22.3174093	0.013707039	0	0.030990277	143.5450426	0.0081128	667.2353452	0.002674	65.3681288	0.02644	0	0.0918886	0	0.03144	44.99200398	0.16884373	23968.82718	25523.835	12.7619175
	Webb	0.02001433	659.486549	0.000400768	0.47783589	0.014781473	0	0.000669531	3.101227953	0.0001478	12.15837814	0.000143	3.49722568	0.004115	0	0.0006373	0	0.000142	0.20255854	0.00072851	103.4185905	782.3423658	0.391171183
	Wharton	0.00014434	4.75609735	0.000178787	0.21316716	0.000106601	0	6.01986E-05	0.278836106	0.001094	89.97412422	0.000249	6.0751218	9.99E-05	0	6.336E-05	0	7.64E-05	0.109328388	0.00010492	14.89403028	116.3007053	0.058150353
	Wichita	0.00020763	6.84166435	0.000209406	0.24967419	0.000153346	0	0.000346701	1.605898436	9.076E-05	7.46464091	2.99E-05	0.7313006	0.000296	0	0.001028	0	0.000352	0.503344369	0.00188893	268.1492958	285.5458187	0.142772909
	Wilbarger	0.02861682	942.944841	0.000573025	0.68321771	0.021134796	0	0.000957307	4.434187327	0.0002114	17.38425136	0.000205	5.00039147	0.005884	0	0.0009112	0	0.000202	0.289621571	0.00104164	147.8696214	1118.606131	0.559303066
	Wise	0.00284449	93.7279208	0.002882008	3.43621784	0.002100781	0	0.00476997	22.09420739	0.0012561	103.3056773	0.000413	10.1010347	0.004182	0	0.0146143	0	0.004798	6.866040699	0.02576141	3657.055042	3896.58614	1.94829307
	Young	0.00623586	205.475973	0.006289085	7.4984748	0.004605458	0	0.010412491	48.23001057	0.0027258	224.1858525	0.000899	21.9631795	0.008883	0	0.0308739	0	0.010564	15.11696112	0.05673017	8053.338293	8575.808745	4.287904373
	Total	1.12183722	36965.3473	1.172570094	1398.05518	1.090766584	0	1.189130767	5507.979961	1.62936	134006.4024	1.542363	37700.6341	1.359386	0	1.2316428	0	1.221806	1748.450853	1.52878695	217024.5242	434351.3939	217.175697

Energy Savings by PCA (MWh)		American Electric Power - West (ERCOT) /PCA		Austin Energy/PCA		Brownsville Public Utils Board/PCA		Lower Colorado River Auhotrity /PCA		Reliant Energy HL&P/PCA		San Antonio Public Service Bd/PCA		South Texas Electric Coop INC/PCA		Texas Municipal Power Pool/PCA		Texas-New Mexico Power Co/PCA		TXU Electric/PCA	
		32,950.72		1,192.30		0.00		4,631.94		82,244.81		24,443.43		0.00		0.00		1,431.04		141,958.65	

Table 38: 2007 Totalized OSD Electricity Savings from IECC / IRC by PCA for Single-family Residences.

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West (ERCOT)/PCA	162.35
Austin Energy/PCA	6.96
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	27.04
Reliant Energy HL&P/PCA	492.19
San Antonio Public Service Bd /PCA	143.44
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	8.85
TXU Electric/PCA	880.24
El Paso Electric Co/PCA	1.49
Entergy Electric System/PCA	150.06
Total	1,872.61

Table 39: 2007 OSD NOx Reductions from IECC / IRC by PCA for Single-family Residences by County Using 2007 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00957217	1.55399435	0.011806715	0.082178729	0.007069474	0	0.004263638	0.115285481	0.0710018	34.94627172	0.01614	2.315163243	0.006781	0	0.0051797	0	0.126288	1.11772723	0.008772	7.721182669	47.85180343	0.023925902
	Chambers	0.0218814	3.55233625	0.027103415	0.188648936	0.016160386	0	0.009125896	0.246757193	0.1658435	81.62628835	0.037677	5.404426744	0.015138	0	0.0096055	0	0.011582	0.10250489	0.015905	14.00044105	105.1214034	0.052560702
	Fort Bend	0.05569551	9.04189078	0.068987309	0.480175005	0.041133619	0	0.023228475	0.628080067	0.4221274	207.7663633	0.095902	13.75608414	0.038531	0	0.0244493	0	0.029479	0.26090944	0.040484	35.63583229	267.569335	0.133784668
	Galveston	0.02755599	4.47357781	0.033893644	0.235911224	0.020351324	0	0.012791501	0.345872345	0.2014466	99.14976909	0.045813	6.571306329	0.019824	0	0.0167751	0	0.594657	5.26307737	0.028709	25.271267	141.3107812	0.070655391
	Harris	0.07736057	12.5591061	0.09582276	0.666958824	0.057134232	0	0.032264145	0.872397644	0.5863312	288.5856364	0.133207	19.1070789	0.05352	0	0.0339599	0	0.040946	0.3624009	0.056232	49.49785508	371.6514339	0.185825717
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00176365	0.28631967	0.003151138	0.021932984	0.001302533	0	0.005050143	0.136551971	0.0020858	1.026583327	0.000604	0.086648695	0.015958	0	0.0637888	0	0.000846	0.00748883	0.004013	3.532594004	5.098119474	0.00254906
	Dallas	0.00504555	0.81912054	0.005305276	0.036926514	0.003726366	0	0.008757286	0.23679028	0.0024131	1.187694169	0.000782	0.112207148	0.00931	0	0.033672	0	0.008209	0.07265631	0.044002	38.73257167	41.19796663	0.020598983
	Denton	0.00063576	0.10321213	0.001170951	0.008150212	0.000469535	0	0.001874207	0.050677114	0.0007854	0.386580227	0.000227	0.032516333	0.006096	0	0.0243999	0	0.00025	0.00221575	0.00114	1.003090642	1.586442415	0.000793221
	Tarrant	0.01557224	2.52807662	0.015705165	0.109313264	0.011500796	0	0.026002176	0.703078832	0.006807	3.350321442	0.002244	0.321851628	0.022184	0	0.0770985	0	0.02638	0.23347587	0.141667	124.7013861	131.9475038	0.065973752
	Ellis	0.00350282	0.56866608	0.003532723	0.024588948	0.002586991	0	0.005848935	0.158150698	0.0015312	0.753621999	0.000505	0.072397372	0.00499	0	0.0173426	0	0.005934	0.05251811	0.031867	28.05035561	29.68029881	0.014840149
	Johnson	0.00033718	0.05473886	0.000621017	0.004322489	0.00024902	0	0.000993991	0.026876757	0.0004166	0.205023963	0.00012	0.017245133	0.003233	0	0.0129406	0	0.000133	0.00117513	0.000604	0.531992079	0.84137441	0.000420687
	Kaufman	0.00649275	1.05406624	0.006548174	0.045577503	0.004795187	0	0.01084145	0.293144462	0.0028381	1.396896239	0.000936	0.134194087	0.009249	0	0.0321458	0	0.010999	0.09734635	0.059067	51.99348788	55.01471276	0.027507356
	Parker	0.00047595	0.07726839	0.000876616	0.006101547	0.000351511	0	0.0014031	0.037938745	0.000588	0.289408124	0.00017	0.024342919	0.004564	0	0.0182667	0	0.000187	0.00165879	0.000853	0.750950413	1.187668927	0.000593834
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00095027	0.1542718	0.000958382	0.006670666	0.000701818	0	0.001586741	0.042904253	0.0004154	0.204447967	0.000137	0.019640477	0.001354	0	0.0047048	0	0.00161	0.01424749	0.008645	7.609701137	8.05188379	0.004025942
	Hood	0.01232788	2.00137062	0.012433111	0.086538657	0.00910469	0	0.020584816	0.556597577	0.0053888	2.652306842	0.001776	0.25479623	0.017562	0	0.0610356	0	0.020884	0.18483291	0.112152	98.72077811	104.4572209	0.05222861
	Hunt	0.00635121	1.03108771	0.006405424	0.044583919	0.004690653	0	0.010605108	0.286753945	0.0027763	1.366444057	0.000915	0.131268671	0.009048	0	0.031445	0	0.010759	0.09522421	0.05778	50.86003566	53.81539817	0.026907699
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03112811	5.0534952	0.048234164	0.335726096	0.0229895	0	0.084461674	2.283778646	0.0010637	0.523558234	1.065347	152.8123903	0.043667	0	0.0043501	0	0.000484	0.00428406	0.002333	2.053244274	163.0664768	0.081533238
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200761	0.32592564	0.076651484	0.533520255	0.00148271	0	0.134326688	3.63209023	0.0012416	0.61107716	0.003567	0.511717586	0.001066	0	0.0018623	0	0.000403	0.00356815	0.001842	1.621157583	7.239056608	0.003619528
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00446951	0.72560357	0.170648096	1.187768469	0.003300936	0	0.299049574	8.086070232	0.002764	1.36043229	0.007942	1.139229501	0.002372	0	0.0041461	0	0.000898	0.00794372	0.0041	3.609159806	16.11620759	0.008058104
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.00246935	0.40088721	0.094281013	0.656227741	0.001823727	0	0.165221279	4.467456189	0.0015271	0.751622417	0.004388	0.629410547	0.001311	0	0.0022907	0	0.000496	0.00438881	0.002265	1.994017224	8.904010144	0.004452005
	Travis	0.00050761	0.08240783	0.298194277	2.075533034	0.000374892	0	0.033779905	0.913382613	0.0003331	0.163965352	0.000902	0.129362101	0.00027	0	0.0004695	0	0.000103	0.00091021	0.000465	0.409434479	3.774995616	0.001887498
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22352453	36.2881003	0.00447587	0.031153568	0.165082827	0	0.007477478	0.202185246	0.001651	0.812611617	0.001598	0.229199287	0.04596	0	0.0071176	0	0.001581	0.01399127	0.008136	7.161814343	44.73905567	0.022369528
	San Patricio	0.05533089	8.9826955	0.001107949	0.007711702	0.040864326	0	0.001850962	0.050048597	0.0004087	0.201152517	0.000396	0.056735607	0.011377	0	0.0017619	0	0.000391	0.00346338	0.002014	1.772823511	11.07463081	0.005537315
Victoria Area	Victoria	0.02060475	3.34507951	0.002090584	0.014551169	0.015217528	0	0.003408874	0.09217334	0.0011319	0.557128621	0.000524	0.075169968	0.495811	0	0.0305841	0	0.00045	0.00398235	0.002128	1.872833968	5.960918932	0.002980459
Other ERCOT counties	Andrews	2.5653E-05	0.00416458	2.58716E-05	0.000180075	1.89456E-05	0	4.28342E-05	0.001158205	1.121E-05	0.005519094	3.7E-06	0.000530197	3.65E-05	0	0.000127	0	4.35E-05	0.00038461	0.000233	0.205424652	0.217361417	0.000108681
	Angelina	0.00032149	0.05219234	0.000324234	0.002256781	0.000237435	0	0.000536817	0.014515117	0.0001405	0.069167645	4.63E-05	0.006644652	0.000458	0	0.0015917	0	0.000545	0.00482013	0.002925	2.574469754	2.724066413	0.001362033
	Bosque	0.00093945	0.15251549	0.001730301	0.012043483	0.000693828	0	0.002769496	0.074885042	0.0011606	0.571245561	0.000335	0.048049046	0.009008	0	0.0360555	0	0.00037	0.00327419	0.001684	1.482256561	2.344269379	0.001172135
	Brazos	0.00191393	0.31071647	0.003525105	0.024535924	0.00141352	0	0.005642234	0.152561653	0.0023645	1.163786054	0.000682	0.097889267	0.018351	0	0.073455	0	0.000754	0.00667044	0.003431	3.019768782	4.775928591	0.002387964
	Calhoun	0.08852525	14.3716355	0.001772635	0.012338142	0.065379841	0	0.0029614	0.080073981	0.0006539	0.321828861	0.000633	0.090772694	0.018202	0	0.0028189	0	0.000626	0.00554114	0.003222	2.836383953	17.7185743	0.008859287
	Cameron	0.05467229	8.87577528	0.001094762	0.00761991	0.285623104	0	0.001828931	0.049452873	0.0004038	0.198758216	0.000391	0.056060288	0.011242	0	0.0017409	0	0.000387	0.00342215	0.00199	1.751721752	10.94281047	0.005471405
	Cherokee	0.003513	0.57031737	0.003542982	0.02466035	0.002594504	0	0.005865919	0.158609937	0.0015356	0.75581037	0.000506	0.0726076	0.005005	0	0.0173929	0	0.005951	0.05267061	0.031959	28.13180837	29.76648462	0.014883242
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.0013551	0.21999367	2.71346E-05	0.000188866	0.001000801	0	4.53316E-05	0.001225732	1.001E-05	0.004926392	9.69E-06	0.001389502	0.000279	0	4.315E-05	0	9.58E-06	8.4821E-05	4.93E-05	0.04341792	0.271226905	0.000135613
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00362926	0.58919298	0.003660242	0.025476525	0.002680373	0	0.006060061	0.163859397	0.0015864	0.780825175	0.000523	0.075010669	0.00517	0	0.0179686	0	0.006148	0.05441384	0.033017	29.06287752	30.7516561	0.015375828
	Fannin	0.00762852	1.23845184	0.007693632	0.053550281	0.005633999	0	0.012737922	0.34442361	0.0033346	1.641252382	0.001099	0.157668379	0.010867	0	0.0377689	0	0.012923	0.11437495	0.0694	61.08860018	64.63832162	0.032319161
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00377443	0.6127607	0.003806652	0.026495586	0.002787588	0	0.006302464	0.170413773	0.0016499	0.812058183	0.000544	0.078011096	0.005377	0	0.0186873	0	0.006394	0.05659039	0.034338	30.22539262	31.98172234	0.015990861
	Frio	0.01476384	2.39683606	0.001497957	0.010426289	0.010903753	0	0.002442547	0.066044584	0.0008111	0.399197079	0.000375	0.053861228	0.355262	0	0.0219143	0	0.000322	0.00285346	0.001525	1.341934019	4.271152721	0.002135576
	Grimes	0.00055442	0.09000803	0.001021149	0.007107541	0.000409467	0	0.001634436	0.044193903	0.0006849	0.33712435	0.000198	0.028356463	0.005316	0	0.0212784	0	0.000218	0.00193229	0.000994	0.874763523	1.383486095	0.000691743
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.239737	38.9201146	0.004800509	0.03341317	0.177056459	0	0.008019827	0.216849956	0.0017708	0.871551197	0.001714	0.245823354	0.049294	0	0.0076338	0	0.001695	0.01500607	0.008726	7.681268312	47.9840267	0.023992013
	Howard	0.00058508	0.09498498	0.000590075	0.004107122	0.000432108	0	0.000976955	0.026416102	0.0002558	0.125878394	8.43E-05	0.012092621	0.000833	0	0.0028967	0	0.000991	0.00877216	0.005323	4.685284821	4.957536206	0.002478768
	Jack	0.00217756	0.35351579	0.002196145	0.015285915	0.001608224	0	0.003636037	0.098315638	0.0009519	0.468495105	0.000314	0.045006402	0.003102	0	0.0107811	0	0.003689	0.0326483	0.01981	17.43772651	18.45099366	0.009225497
	Jones	0.04250012	6.89968472	0.000851025	0.005923424	0.031388236	0	0.00142174	0.038442752	0.0003139	0.154506957	0.000304	0.043579102	0.008739	0	0.0013533	0	0.000301	0.00266025	0.001547	1.3617208	8.506518008	0.004253259
	Lamar	0.00107998	0.17532948	0.001089199	0.007581193	0.000797614	0	0.001803327	0.048760567	0.0004721	0.232354559	0.000156	0.022321349	0.001539	0	0.005347	0	0.00183	0.01619223	0.009825	8.648404655	9.150944038	0.004575472
	Limestone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Llano	0.00124346	0.20186956	0.047475864	0.33044807	0.000918351	0	0.083198331	2.249618818	0.000769	0.378484727	0.00221	0.316944084	0.00066	0	0.0011535	0	0.00025	0.00221002	0.001141	1.004101323	4.4836766	0.002241838
	McLennan	0.02303137	3.73902867	0.023227961	0.161674462	0.017009692	0	0.038457253	1.039854525	0.0100675	4.955129858	0.003319	0.476018984	0.03281	0	0.1140288	0	0.039015	0.34531112	0.209526	184.4335156	195.1505332	0.097575267
	Milam	0.00165249	0.26827391	0.001666598	0.011600082	0.001220439	0	0.002759294	0.074609175	0.0007223	0.35552872	0.000238	0.034154185	0.002354	0	0.0081815	0	0.002799	0.02477594	0.015033	13.23303599	14.00197801	0.007000989
	Mitchell	0.01696145	2.75360794	0.017106233	0.11906517	0.012526789	0	0.028321847	0.765800943	0.0074142	3.649205756	0.002444	0.350564217	0.024163	0	0.0839765	0	0.028733	0.2543044	0.154305	135.8260764	143.7186248	0.071859312
	Nolan	0.00060327	0.09793837	0.000608422	0.004234825	0.000445544	0	0.001007331	0.027237463	0.0002637	0.129792354	8.69E-05	0.012468619	0.000859	0	0.0029868	0	0.001022	0.00904492	0.005488	4.830965232	5.111681778	0.002555841
	Palo Pinto	0.00307488	0.49919144	0.00566337	0.03941897	0.002270935	0	0.00906471	0.245102782	0.0037988	1.869717541	0.001096	0.15726712	0.029483	0	0.1180115	0	0.001211	0.01071661	0.005512	4.85150569	7.67292015	0.00383646
	Pecos	4.2262E-05	0.00686099	4.26225E-05	0.000296667	3.12122E-05	0	7.05678E-05	0.001908098	1.847E-05	0.009092496	6.09E-06	0.000873479	6.02E-05	0	0.0002092	0	7.16E-05	0.00063363	0.000384	0.338429259	0.358094624	0.000179047
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00035926	0.05832367	0.000406685	0.002830665	0.000265328	0	0.000358385	0.009690466	0.0015339	0.754951946	0.000356	0.051054302	0.000371	0	0.0009089	0	0.093323	0.82596999	0.001655	1.456509778	3.159330825	0.001579665
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tom Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upton	3.2238E-05	0.00523367	3.25131E-05	0.000226302	2.38092E-05	0	5.38302E-05	0.001455527	1.409E-05	0.006935898	4.65E-06	0.000666303	4.59E-05	0	0.0001596	0	5.46E-05	0.00048335	0.000293	0.25815915	0.273160199	0.00013658
	Ward	0.01980763	3.21566999	0.0199767	0.139044592	0.014628815	0	0.033074321	0.894304185	0.0086584	4.261551269	0.002854	0.409389736	0.028218	0	0.098068	0	0.033554	0.2969773	0.180198	158.6180191	167.8349561	0.083917478
	Webb	0.01418005	2.30206022	0.000283942	0.001976334	0.010472596	0	0.000474359	0.012826315	0.0001047	0.051550808	0.000101	0.014540044	0.002916	0	0.0004515	0	0.0001	0.00088758	0.000516	0.454334279	2.838175586	0.001419088
	Wharton	0.00015439	0.02506445	0.000191235	0.001331063	0.000114024	0	6.43902E-05	0.001741061	0.0011702	0.575935914	0.000266	0.038132365	0.000107	0	6.777E-05	0	8.17E-05	0.00072325	0.000112	0.098783823	0.741711926	0.000370856
	Wichita	0.00021984	0.03569041	0.000221719	0.001543243	0.000162364	0	0.000367089	0.009925797	9.61E-05	0.04729855	3.17E-05	0.004543778	0.000313	0	0.0010884	0	0.000372	0.00329612	0.002	1.760486233	1.862784137	0.000931392
	Wilbarger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wise	0.00291847	0.47379931	0.002955932	0.020574285	0.002155421	0	0.004892446	0.132287975	0.0012878	0.633817591	0.000424	0.060778794	0.004281	0	0.0149528	0	0.004924	0.04358356	0.026441	23.27406358	24.63890509	0.012319453
	Young	0.00549666	0.89235557	0.005543579	0.038585184	0.004059529	0	0.009178198	0.248171401	0.0024027	1.182589956	0.000792	0.113606562	0.00783	0	0.0272141	0	0.009311	0.08241186	0.050005	44.01685311	46.57457365	0.023287287
	Total	**1.14303735**	**185.566457**	**1.154658244**	**8.036811943**	**1.089429227**	**0**	**1.180868675**	**31.92977981**	**1.5393506**	**757.6510744**	**1.443965**	**207.1210594**	**1.481727**	**0**	**1.2697054**	**0**	**1.151969**	**10.1956332**	**1.517783**	**1336.01607**	**2536.516886**	**1.268258443**

Energy Savings by PCA (MWh)																							
		162.35		6.96		0.00		27.04		492.19		143.44		0.00		0.00		8.85		880.24			

6.1.2 2007 Results for New Multi-family Residential Construction.

In this section of the report, calculations are provided regarding the potential electricity reductions and associated emissions reductions from the implementation of the IECC / IRC to new multi-family residences in all the counties in ERCOT region as well as the 41 non-attainment and affected counties. To calculate the NOx emissions reductions from the implementation of the IECC /IRC in multi-family residences, new construction activity by county had to be determined. Then, energy savings attributable to the IECC / IRC had to be modeled using the code-traceable, DOE-2 simulation that the Laboratory has developed for the TERP. Next, these estimates were applied to the NAHB's survey data to determine the appropriate number of housing types. In addition, estimates of the NOx reduction potential from the electricity reductions in each county were calculated using the US EPA's 2007 eGRID database[28].

In Table 40 and Table 41, the 1999 and IECC / IRC code-compliant building characteristics for multi-family are shown for each county. The IECC / IRC code-compliant characteristics are the minimum building code characteristics required by the IECC / IRC for each county for multi-family residences (i.e., Type A.2). In Table 40 and Table 41, the rows are sorted first by the US EPA's non-attainment and affected designation, then alphabetically. Next, in the third column, the location of the TMY2 weather file is listed, followed by the NAHB survey classification. The fifth column in Table 40 and Table 41 lists the window area for the average house as defined by the NAHB survey[29]. The sixth, seventh, eighth and ninth columns show the NAHB's average glazing U-value, Solar Heat Gain Coefficient (SHGC), roof insulation and wall insulation, respectively. In columns ten through fourteen of Table 40 and Table 41, the corresponding values from the IECC / IRC code-compliant house are listed for each county (i.e., percent area, glazing U-value, SHGC, roof and wall insulation R-value). For each county the identical window percent area was used for the 1999 and code-compliant calculation (i.e., window-to-wall area).

The IECC / IRC SHGC is 0.4 for all non-attainment and affected counties since they all fall below the 3,500 HDD_{65}, as required by the IECC / IRC. All houses were assumed to have an air conditioner efficiency[30] equal to a SEER 11, and a furnace efficiency (AFUE) or 0.80. The values shown in Table 40 and Table 41, represent the only changes that were made to the simulation to obtain the savings calculations. All other variables in the simulation remained the same for the 1999 and IECC / IRC code-compliant simulation. In cases where the 1999 values were more efficient than the IECC / IRC code-compliant simulation, the 1999 values were used in both simulations, since this indicates that the prevailing practice is already above code.

In Table 42 and Table 43, the code-traceable simulation results for multi-family are shown for each county. In a similar fashion as Table 40 and Table 41, this table is first divided into US EPA affected and then non-attainment classifications, followed by an alphabetical listing of counties. In the third column, the IECC / IRC climate zone is listed followed by the number of projected new housing units[31] in the fourth column. In the fifth column, the total simulated energy use is listed if all new construction had been built to pre-code specifications, and, in the sixth column, the total county-wide energy use for code-compliant construction is shown. In a similar fashion as the 2006 report, the values in the fifth and sixth columns come from the associated tables in the 2007 Volume III Appendix to the 2007 Volume II Technical report. As previously explained, in the 2007 report, 18 simulations were run for each county, which were then distributed according to the NAHB's survey data to account for 1, 2 or 3 story, and 3 fuel options (i.e., central air conditioning with electric resistance heating, heat pump heating, or a natural gas-fired furnace).

In the seventh and eighth columns, the total pre-code and code-compliant peak-day energy use is reported for peak OSD, Episode Day for the 2007 annual report across all counties. In a similar fashion as the annual pre-code and code-compliant energy use, these values are from the associated tables for each county in the Volume III Appendix to this report.

In the ninth and tenth columns, the total annual electricity and Ozone Season Day savings are shown for each county, respectively. In similar fashion as the 2006 report, a 7% transmission and distribution loss is used in the 2007 report, which represents a fixed 1.07 multiplier for the electricity use. In the eleventh and twelfth columns, the total annual pre-code and code-compliant natural gas use is shown for those residences that had natural gas-fired furnaces and domestic water heaters. Similarly, in columns thirteen and fourteen, the simulated total peak OSD natural gas use on

[28] This analysis assumes transmission and distribution losses of 7%. Counties were assigned to utility service districts as indicated in a fashion similar to the 2004 report.

[29] In a similar fashion as single-family, this value represents the NAHB's reported number of window units times an average window size of 3 x 5 feet, which was determined by surveying local building suppliers. Additional information about the procedures used to determine these values can be found in Im (2003).

[30] In a similar fashion as single-family, the choice of a SEER 11 efficiency for the air conditioner was based on ARI sales numbers for Texas which show an average SEER 11 for houses built in 1999.

[31] The number of projected new housing units uses the published values for the new housing units in 2006. A vacancy rate of 0% was assumed for 2006 calculations, based on information suggested by the Real Estate Center at Texas A&M University.

the OSD, is shown for each county. Finally, in columns fifteen and sixteen, the total annual and peak-day natural gas savings are shown for each county.

In Table 44, the annual electricity savings from Table 42 and Table 43 are assigned to PCA provider(s) in a similar fashion as the single-family residential assignments. The total electricity savings for each PCA, as shown in Table 44, are then entered into the bottom row of Table 45 and Table 47, the 2007 US EPA eGRID database for Texas. eGRID then proportions each MWh of electricity savings according to the 1999 measured data from the power plants assigned to that PCA. For each county in which there is a power plant, the lbs-NOx/MWh are calculated and displayed as NOx reductions (lbs) in the column adjacent to the PCA column. In a similar fashion as the single-family residences, adding across the rows then totals the NOx reductions in each county from multiple PCAs that have power plants in that county. Counties that do not show NOx reductions represent counties that do not have power plants in eGRID's database. In Table 45, the PCA assignments for peak OSD reductions are shown for each county, and, in Table 47, the peak OSD NOx reductions are shown calculated with the 2007 eGRID.

Table 40: 1999 and IECC / IRC Code-compliant Building Characteristics used in the DOE-2 Simulation for Multi-family Residential (1).

		Climate Zone	1999 Average					2000 IECC				
			Area %	Glazing U-value (Btu/ hr-ft2-F)	SHGC	Roof Insulation (hr-ft2-F/Btu)	Wall Insulation (hr-ft2-F/Btu)	Area %	Glazing U-value (Btu/ hr-ft2-F)	SHGC	Roof Insulation (hr-ft2-F/Btu)	Wall Insulation (hr-ft2-F/Btu)
Non-attainment	BRAZORIA	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	CHAMBERS	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	COLLIN	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	DALLAS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	DENTON	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	EL PASO	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	FORT BEND	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	GALVESTON	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	HARDIN	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	HARRIS	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	JEFFERSON	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	LIBERTY	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	MONTGOMERY	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	ORANGE	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	TARRANT	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	WALLER	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
Affected	BASTROP	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	BEXAR	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	CALDWELL	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	COMAL	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	ELLIS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	GREGG	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	GUADALUPE	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	HARRISON	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	HAYS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	HENDERSON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	HOOD	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	HUNT	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	JOHNSON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	KAUFMAN	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	NUECES	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	PARKER	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	ROCKWALL	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	RUSK	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	SAN PATRICIO	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	SMITH	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	TRAVIS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	UPSHUR	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	VICTORIA	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	WILLIAMSON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	WILSON	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
ERCOT	ANDERSON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	ANDREWS	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	ANGELINA	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	ARANSAS	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	ARCHER	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	ATASCOSA	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	AUSTIN	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	BANDERA	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	BAYLOR	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	BEE	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	BELL	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	BLANCO	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	BORDEN	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	BOSQUE	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	BRAZOS	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	BREWSTER	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	BRISCOE	8	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	BROOKS	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	BROWN	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	BURLESON	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	BURNET	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	CALHOUN	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	CALLAHAN	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	CAMERON	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	CHEROKEE	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	CHILDRESS	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	CLAY	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	COKE	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	COLEMAN	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	COLORADO	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	COMANCHE	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	CONCHO	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	COOKE	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	CORYELL	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	COTTLE	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	CRANE	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	CROCKETT	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	CROSBY	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	CULBERSON	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	DAWSON	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	DE WITT	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	DELTA	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	DICKENS	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	DIMMIT	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	DUVAL	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	EASTLAND	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	ECTOR	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	EDWARDS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	ERATH	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	FALLS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	FANNIN	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	FAYETTE	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	FISHER	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	FOARD	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	FRANKLIN	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	FREESTONE	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00

Table 41: 1999 and IECC / IRC Code-compliant Building Characteristics used in the DOE-2 Simulation for Multi-family Residential (2).

		Climate Zone	1999 Average					2000 IECC				
			Area %	Glazing U-value (Btu/ hr-ft2-F)	SHGC	Roof Insulation (hr-ft2-F/Btu)	Wall Insulation (hr-ft2-F/Btu)	Area %	Glazing U-value (Btu/ hr-ft2-F)	SHGC	Roof Insulation (hr-ft2-F/Btu)	Wall Insulation (hr-ft2-F/Btu)
	FRIO	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	GILLESPIE	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	GLASSCOCK	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	GOLIAD	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	GONZALES	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	GRAYSON	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	GRIMES	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	HALL	8	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	HAMILTON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	HARDEMAN	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	HASKELL	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	HIDALGO	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	HILL	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	HOPKINS	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	HOUSTON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	HOWARD	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	HUDSPETH	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	IRION	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	JACK	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	JACKSON	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	JEFF DAVIS	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	JIM HOGG	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	JIM WELLS	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	JONES	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	KARNES	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	KENDALL	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	KENEDY	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	KENT	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	KERR	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	KIMBLE	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	KING	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	KINNEY	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	KLEBERG	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	KNOX	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	LA SALLE	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	LAMAR	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	LAMPASAS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	LAVACA	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	LEE	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	LEON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	LIMESTONE	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	LIVE OAK	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	LLANO	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	LOVING	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	MADISON	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	MARTIN	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	MASON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	MATAGORDA	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	MAVERICK	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	MCCULLOCH	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	MCLENNAN	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	MCMULLEN	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
ERCOT	MEDINA	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	MENARD	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	MIDLAND	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	MILAM	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	MILLS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	MITCHELL	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	MONTAGUE	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	MOTLEY	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	NACOGDOCHES	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	NAVARRO	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	NOLAN	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	PALO PINTO	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	PECOS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	PRESIDIO	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	RAINS	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	REAGAN	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	REAL	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	RED RIVER	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	REEVES	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	REFUGIO	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	ROBERTSON	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	RUNNELS	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	SAN SABA	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	SCHLEICHER	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	SCURRY	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	SHACKELFORD	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	SOMERVELL	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	STARR	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	STEPHENS	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	STERLING	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	STONEWALL	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	SUTTON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	TAYLOR	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	TERRELL	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	THROCKMORTON	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	TITUS	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	TOM GREEN	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	UPTON	5	7.5%	0.75	0.61	36.08	21.41	7.5%	0.70	0.40	19.00	11.00
	UVALDE	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	VAL VERDE	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	VAN ZANDT	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	WARD	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	WASHINGTON	4	7.5%	0.75	0.61	36.08	21.41	7.5%	0.85	0.40	19.00	11.00
	WEBB	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	WHARTON	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	WICHITA	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	WILBARGER	7	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	WILLACY	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	WINKLER	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	WISE	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	YOUNG	6	7.5%	0.75	0.61	36.08	21.41	7.5%	0.55	0.40	30.00	13.00
	ZAPATA	2	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00
	ZAVALA	3	7.5%	0.75	0.61	36.08	21.41	7.5%	any	0.40	19.00	11.00

Table 42: 2007 Annual and OSD Electricity and Natural Gas Savings from Implementation of the IECC / IRC for Multi-family Residences (1).

2006 Summary															
	County	Climate Zone	No. of Projected Units (2006)	Precode Total Annual Elec. Use (MWh/yr)	Code-compliant Total Annual Elec. Use (MWh/yr)	Precode OSD Elec. Use (MWh/day)	Code-compliant OSD Elec. Use (MWh/day)	Total Annual Elec. Savings (MWh/yr) w/ 7% of T&D Loss	Total OSD Elec. Savings (MWh/day) w/ 7% of T&D Loss	Precode Total NG Use (Therm/yr)	Code-compliant Total NG Use (Therm/yr)	Precode OSD NG Use (Therm/day)	Code-compliant OSD NG Use (Therm/day)	Total Annual NG Savings (Therm/yr)	Total OSD NG Savings (Therm/day)
Affected County	BASTROP	4	76	540	512	1.87	1.70	29.43	0.18	2,935	2,321	6.93	5.15	614.45	1.78
	BEXAR	4	5,792	40,550	38,703	137.33	125.53	1,976.11	12.63	228,276	181,479	534.43	398.90	46,797.41	135.53
	CALDWELL	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	COMAL	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	ELLIS	5	8	61	59	0.20	0.19	2.61	0.02	370	310	0.73	0.54	60.68	0.19
	GREGG	6	222	1,660	1,576	5.57	5.03	89.91	0.58	9,952	8,021	20.14	14.95	1,931.55	5.19
	GUADALUPE	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	HARRISON	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	HAYS	5	526	3,735	3,541	12.94	11.75	207.52	1.26	20,317	15,988	47.96	35.65	4,328.21	12.31
	HENDERSON	5	8	61	59	0.20	0.19	2.60	0.02	371	310	0.73	0.54	61.03	0.19
	HOOD	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	HUNT	6	10	76	73	0.26	0.23	4.11	0.03	463	377	0.91	0.67	86.06	0.23
	JOHNSON	5	60	458	440	1.53	1.39	19.55	0.15	2,778	2,322	5.44	4.04	455.08	1.40
	KAUFMAN	6	110	840	798	2.81	2.53	45.02	0.29	5,097	4,146	9.98	7.41	951.42	2.57
	NUECES	3	1,171	8,521	8,013	28.66	26.16	544.20	2.68	43,718	34,013	107.14	79.74	9,704.85	27.40
	PARKER	6	184	1,405	1,335	4.70	4.24	75.39	0.49	8,517	6,934	16.69	12.39	1,583.48	4.31
	ROCKWALL	6	30	229	218	0.77	0.69	12.29	0.08	1,389	1,131	2.72	2.02	258.18	0.70
	RUSK	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	SAN PATRICIO	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	SMITH	5	103	770	739	2.59	2.35	33.60	0.26	4,613	3,821	9.34	6.93	791.27	2.41
	TRAVIS	5	6,163	43,775	41,497	151.59	137.72	2,436.77	14.83	237,777	187,332	561.91	417.70	50,444.73	144.21
	UPSHUR	6	53	396	376	1.33	1.20	21.49	0.14	2,376	1,915	4.81	3.57	461.28	1.24
	VICTORIA	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	WILLIAMSON	5	1,716	12,191	11,556	42.23	38.36	679.89	4.14	66,206	52,155	156.46	116.30	14,050.25	40.15
	WILSON	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
Nonattainment County	BRAZORIA	3	302	2,136	2,026	7.23	6.60	117.78	0.68	11,608	9,151	27.73	20.67	2,457.15	7.07
	CHAMBERS	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	COLLIN	6	2,746	20,989	20,145	70.22	63.64	902.39	7.04	127,112	106,165	249.13	184.87	20,946.92	64.26
	DALLAS	5	5,615	42,893	41,181	143.34	129.96	1,831.31	14.31	259,932	217,344	509.41	378.02	42,588.20	131.39
	DENTON	6	326	2,491	2,366	8.33	7.52	133.94	0.87	15,090	12,271	29.58	21.95	2,819.67	7.63
	EL PASO	6	263	1,899	1,811	5.76	5.28	93.37	0.51	11,733	9,520	25.08	18.93	2,212.85	6.15
	FORT BEND	4	886	6,269	5,945	21.23	19.38	346.55	1.98	34,056	26,847	81.37	60.63	7,208.73	20.73
	GALVESTON	3	309	19,326	18,329	65.43	59.73	1,065.91	6.11	105,012	82,784	250.89	186.96	22,228.27	63.93
	HARDIN	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	HARRIS	4	13,432	95,041	90,132	321.87	293.77	5,252.69	30.07	516,295	407,009	1,233.52	919.21	109,286.26	314.31
	JEFFERSON	4	1,036	7,375	6,988	24.95	22.74	414.29	2.37	40,372	31,996	96.18	71.94	8,375.95	24.24
	LIBERTY	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00
	MONTGOMERY	4	1,468	10,395	9,855	35.22	32.14	577.38	3.30	56,423	44,479	134.81	100.46	11,944.27	34.35
	ORANGE	4	12	85	81	0.29	0.26	4.80	0.03	468	371	1.11	0.83	97.02	0.28
	TARRANT	5	3,806	29,072	27,911	97.18	88.10	1,242.32	9.71	176,189	147,322	345.29	256.23	28,867.44	89.06
	WALLER	4	155	1,097	1,041	3.72	3.39	60.94	0.35	5,957	4,696	14.23	10.61	1,261.15	3.63
ERCOT	ANDERSON	5	76	545	525	1.75	1.61	20.94	0.16	3,381	2,794	7.22	5.44	**587**	**1.78**
	ANDREWS	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	ANGELINA	5	57	409	394	1.32	1.21	15.70	0.12	2,536	2,095	5.41	4.08	**441**	**1.33**
	ARANSAS	3	16	116	109	0.39	0.36	7.44	0.04	597	465	1.46	1.09	**133**	**0.37**
	ARCHER	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	ATASCOSA	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	AUSTIN	4	5	35	34	0.12	0.11	1.96	0.01	192	152	0.46	0.34	**41**	**0.12**
	BANDERA	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BAYLOR	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BEE	3	2	14	13	0.05	0.04	0.71	0.00	79	63	0.19	0.14	**16**	**0.05**
	BELL	5	1,597	13,260	12,990	41.96	40.45	289.29	1.62	69,454	58,025	151.34	113.97	**11,429**	**37.37**
	BLANCO	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BORDEN	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BOSQUE	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BRAZOS	4	665	4,705	4,462	15.94	14.54	260.05	1.49	25,561	20,150	61.07	45.51	**5,411**	**15.56**
	BREWSTER	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BRISCOE	8	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BROOKS	2	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BROWN	5	60	498	488	1.58	1.52	10.87	0.06	2,609	2,180	5.69	4.28	**429**	**1.40**
	BURLESON	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	BURNET	5	24	170	162	0.59	0.54	9.49	0.06	926	730	2.19	1.63	**196**	**0.56**
	CALHOUN	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	CALLAHAN	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	CAMERON	2	550	4,470	4,303	14.30	13.75	179.11	0.58	20,213	15,656	50.10	37.23	**4,557**	**12.87**
	CHEROKEE	5	8	57	55	0.18	0.17	2.20	0.02	356	294	0.76	0.57	**62**	**0.19**
	CHILDRESS	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	CLAY	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	COKE	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	COLEMAN	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	COLORADO	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	COMANCHE	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	CONCHO	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	COOKE	6	148	1,131	1,074	3.78	3.41	60.77	0.40	6,851	5,578	13.43	9.96	**1,274**	**3.46**
	CORYELL	5	164	1,362	1,334	4.31	4.15	29.71	0.17	7,132	5,959	15.54	11.70	**1,174**	**3.84**
	COTTLE	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	CRANE	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	CROCKETT	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	CROSBY	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	CULBERSON	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	DAWSON	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	DE WITT	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	DELTA	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	DICKENS	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	DIMMIT	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	DUVAL	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	EASTLAND	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	ECTOR	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	EDWARDS	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	ERATH	6	16	139	136	0.41	0.40	3.38	0.02	750	635	1.54	1.16	**115**	**0.37**
	FALLS	5	4	33	33	0.11	0.10	0.72	0.00	174	145	0.38	0.29	**29**	**0.09**
	FANNIN	6	11	84	80	0.28	0.25	4.52	0.03	509	415	1.00	0.74	**95**	**0.26**
	FAYETTE	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	FISHER	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	FOARD	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	FRANKLIN	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	FREESTONE	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**
	FRIO	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	**0**	**0.00**

Table 43: 2007 Annual and OSD Electricity and Natural Gas Savings from Implementation of the IECC / IRC for Multi-family Residences (2).

2006 Summary															
	County	Climate Zone	No. of Projected Units (2006)	Precode Total Annual Elec. Use (MWh/yr)	Code-compliant Total Annual Elec. Use (MWh/yr)	Precode OSD Elec. Use (MWh/day)	Code-compliant OSD Elec. Use (MWh/day)	Total Annual Elec. Savings (MWh/yr) w/ 7% of T&D Loss	Total OSD Elec. Savings (MWh/day) w/ 7% of T&D Loss	Precode Total NG Use (Therm/yr)	Code-compliant Total NG Use (Therm/yr)	Precode OSD NG Use (Therm/day)	Code-compliant OSD NG Use (Therm/day)	Total Annual NG Savings (Therm/yr)	Total OSD NG Savings (Therm/day)
ERCOT	GILLESPIE	5	57	405	384	1.40	1.27	22.54	0.14	2,199	1,733	5.20	3.86	467	1.33
	GLASSCOCK	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	GOLIAD	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	GONZALES	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	GRAYSON	6	90	688	653	2.30	2.07	36.96	0.24	4,166	3,392	8.17	6.06	775	2.11
	GRIMES	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	HALL	8	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	HAMILTON	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	HARDEMAN	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	HASKELL	6	4	35	34	0.10	0.10	0.85	0.00	188	159	0.38	0.29	29	0.09
	HIDALGO	2	1,176	9,558	9,200	30.57	29.41	382.98	1.25	43,219	33,476	107.13	79.61	9,743	27.52
	HILL	5	38	316	309	1.00	0.96	6.88	0.04	1,653	1,381	3.60	2.71	272	0.89
	HOPKINS	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	HOUSTON	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	HOWARD	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	HUDSPETH	6	10	81	79	0.26	0.25	2.44	0.01	417	336	0.95	0.72	80	0.23
	IRION	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	JACK	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	JACKSON	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	JEFF DAVIS	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	JIM HOGG	2	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	JIM WELLS	3	2	15	14	0.05	0.04	0.93	0.00	75	58	0.18	0.14	17	0.05
	JONES	6	16	139	136	0.41	0.40	3.38	0.02	750	635	1.54	1.16	115	0.37
	KARNES	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	KENDALL	5	128	1,008	977	3.36	3.25	33.78	0.12	4,878	3,830	11.81	8.82	1,048	3.00
	KENEDY	2	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	KENT	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	KERR	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	KIMBLE	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	KING	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	KINNEY	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	KLEBERG	2	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	KNOX	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	LA SALLE	3	10	73	68	0.24	0.22	4.65	0.02	373	290	0.91	0.68	83	0.23
	LAMAR	6	19	145	139	0.49	0.44	6.24	0.05	880	735	1.72	1.28	145	0.44
	LAMPASAS	5	4	33	33	0.11	0.10	0.72	0.00	174	145	0.38	0.29	29	0.09
	LAVACA	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	LEE	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	LEON	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	LIMESTONE	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	LIVE OAK	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	LLANO	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	LOVING	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MADISON	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MARTIN	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MASON	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MATAGORDA	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MAVERICK	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MCCULLOCH	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MCLENNAN	5	95	789	773	2.50	2.41	17.21	0.10	4,132	3,452	9.00	6.78	680	2.22
	MCMULLEN	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MEDINA	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MENARD	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MIDLAND	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MILAM	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MILLS	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MITCHELL	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MONTAGUE	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	MOTLEY	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	NACOGDOCH	5	204	1,463	1,410	4.71	4.31	56.20	0.42	9,075	7,499	19.38	14.60	1,577	4.77
	NAVARRO	5	78	648	634	2.05	1.98	14.13	0.08	3,392	2,834	7.39	5.57	558	1.83
	NOLAN	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	PALO PINTO	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	PECOS	5	48	414	406	1.23	1.18	8.14	0.05	2,225	1,900	4.58	3.45	324	1.12
	PRESIDIO	5	2	17	17	0.05	0.05	0.34	0.00	93	79	0.19	0.14	14	0.05
	RAINS	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	REAGAN	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	REAL	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	RED RIVER	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	REEVES	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	REFUGIO	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	ROBERTSON	4	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	RUNNELS	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	SAN SABA	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	SCHLEICHER	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	SCURRY	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	SHACKELFOR	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	SOMERVELL	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	STARR	2	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	STEPHENS	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	STERLING	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	STONEWALL	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	SUTTON	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	TAYLOR	6	16	139	136	0.41	0.40	3.38	0.02	750	635	1.54	1.16	115	0.37
	TERRELL	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	THROCKMOR	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	TITUS	6	14	107	103	0.36	0.32	4.60	0.04	648	541	1.27	0.94	107	0.33
	TOM GREEN	5	120	1,035	1,016	3.07	2.95	20.34	0.13	5,562	4,751	11.44	8.64	811	2.81
	UPTON	5	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	UVALDE	4	4	28	27	0.09	0.09	1.36	0.01	158	125	0.37	0.28	32	0.09
	VAL VERDE	4	128	896	855	3.03	2.77	43.67	0.28	5,045	4,011	11.81	8.82	1,034	3.00
	VAN ZANDT	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	WARD	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	WASHINGTON	4	40	283	268	0.96	0.87	15.64	0.09	1,538	1,212	3.67	2.74	325	0.94
	WEBB	3	454	3,304	3,106	11.11	10.14	210.99	1.04	16,949	13,187	41.54	30.92	3,763	10.62
	WHARTON	3	18	127	121	0.43	0.39	6.36	0.04	709	563	1.68	1.26	146	0.42
	WICHITA	7	30	269	263	0.77	0.75	6.36	0.03	1,471	1,260	2.86	2.15	210	0.70
	WILBARGER	7	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	WILLACY	2	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	WINKLER	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	WISE	6	28	214	205	0.72	0.65	9.20	0.07	1,296	1,083	2.54	1.89	214	0.66
	YOUNG	6	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	ZAPATA	2	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	ZAVALA	3	0	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0	0.00
	TOTAL		52,824					20,041	124.15					441,572	1,293

Table 44: 2007 Total Annual Electricity Savings from IECC / IRC by PCA for Multi-family Residences.

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West(ERCOT)/PCA	1,441.11
Austin Energy/PCA	107.40
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	219.45
Reliant Energy HL&P/PCA	5,735.09
San Antonio Public Service Bd /PCA	1,990.64
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	70.96
TXU Electric/PCA	8,035.02
El Paso Electric Co/PCA	5.48
Entergy Electric System/PCA	1,812.30
Total	19,417.44

Table 45: 2007 Annual NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00883113	12.7266369	0.010890729	1.1696843	0.006522185	0	0.003944232	0.865573324	0.0654443	375.3290059	0.014877	29.6155519	0.006262	0	0.0048171	0	0.121275	8.605093949	0.00816387	65.59683447	493.9083809	0.24695419
	Chambers	0.02176222	31.3617657	0.026955801	2.89510255	0.016072371	0	0.009076193	1.991797366	0.1649402	945.9472968	0.037472	74.5936888	0.015056	0	0.0095532	0	0.011519	0.817304217	0.01581859	127.102657	1184.709612	0.592354806
	Fort Bend	0.07043123	101.499186	0.087239726	9.36970693	0.052016606	0	0.029374182	6.446250957	0.5338124	3061.462864	0.121275	241.414938	0.048726	0	0.030918	0	0.037279	2.645122533	0.05119528	411.3549091	3834.192978	1.917096489
	Galveston	0.03385674	48.7913005	0.041710519	4.47978635	0.025004711	0	0.015351589	3.368951466	0.2495874	1431.406475	0.056747	112.96271	0.024143	0	0.0192972	0	0.567751	40.28492541	0.03283689	263.8449395	1905.139088	0.952569544
	Harris	0.06826733	98.3807657	0.084559408	9.08183577	0.050418468	0	0.028471701	6.248198898	0.5174117	2967.403692	0.117549	233.997801	0.047229	0	0.0299681	0	0.036133	2.563854837	0.04962237	398.7166039	3716.392753	1.858196376
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00203914	2.93861896	0.003716345	0.39914224	0.001505992	0	0.005950953	1.30595414	0.0024815	14.23150466	0.000717	1.42738684	0.019166	0	0.0766809	0	0.000864	0.061334431	0.0040002	32.14166909	52.50561037	0.026252805
	Dallas	0.00453947	6.54187928	0.004683963	0.50306619	0.003352602	0	0.00774211	1.699028886	0.0020856	11.96117123	0.000681	1.35574304	0.007503	0	0.026717	0	0.007525	0.533933451	0.04037045	324.3772797	346.9721018	0.173486051
	Denton	0.00047388	0.68291384	0.000872802	0.09374049	0.000349982	0	0.001396994	0.306574423	0.0005854	3.357571282	0.000169	0.33635875	0.004544	0	0.0181872	0	0.000187	0.013240638	0.00084941	6.824986628	11.61538605	0.005807693
	Tarrant	0.01216249	17.5274947	0.012266309	1.31742417	0.008982543	0	0.020308652	4.456793679	0.0053165	30.49064021	0.001753	3.48860127	0.017326	0	0.0602168	0	0.020603	1.461922391	0.11064724	889.0524191	947.7952955	0.473897648
	Ellis	0.00327981	4.72657354	0.003307809	0.35526482	0.002422289	0	0.005476558	1.201846779	0.0014337	8.222296196	0.000473	0.94075798	0.004672	0	0.0162384	0	0.005556	0.394231109	0.02983782	239.7474199	255.5883903	0.127794195
	Johnson	0.00028606	0.41224186	0.000526868	0.05658657	0.000211267	0	0.000843297	0.185064066	0.0003534	2.026802451	0.000102	0.20304342	0.002743	0	0.0109787	0	0.000113	0.007992729	0.00051274	4.11991242	7.011643517	0.003505822
	Kaufman	0.00632545	9.11567569	0.006379446	0.68516418	0.004671629	0	0.010562096	2.317883215	0.002765	15.85753083	0.000911	1.81434702	0.009011	0	0.0313175	0	0.010715	0.760314616	0.05754527	462.377177	492.9280925	0.246464046
	Parker	0.00021749	0.31342636	0.000400576	0.04302262	0.000160626	0	0.000641157	0.140703704	0.0002687	1.540972369	7.75E-05	0.15437335	0.002085	0	0.0083471	0	8.56E-05	0.00607685	0.00038984	3.132358163	5.33093342	0.002665467
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00081989	1.18155915	0.000826893	0.08880987	0.000605529	0	0.001369042	0.300440276	0.0003584	2.055427514	0.000118	0.23517273	0.001168	0	0.0040593	0	0.001389	0.098550751	0.00745892	59.93258228	63.89254257	0.031946271
	Hood	0.01252711	18.0529489	0.012634039	1.35691904	0.009251829	0	0.020917482	4.59040325	0.0054759	31.40471469	0.001805	3.59318554	0.017846	0	0.062022	0	0.021221	1.505749151	0.11396431	915.7051925	976.2091132	0.488104557
	Hunt	0.00618756	8.91695498	0.006240374	0.67022767	0.004569788	0	0.010331844	2.267353621	0.0027047	15.51183843	0.000892	1.77479446	0.008815	0	0.0306347	0	0.010482	0.743739842	0.05629078	452.2974062	482.1823152	0.241091158
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03341375	48.1529056	0.051775843	5.56082072	0.024677545	0	0.090663423	19.89635596	0.0011418	6.548564177	1.143572	2276.43483	0.046874	0	0.0046695	0	0.00052	0.03686709	0.00250387	20.118599	2376.74894	1.18837447
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200047	2.88289413	0.076378745	8.20321752	0.001477434	0	0.133848731	29.37349916	0.0012371	7.095069718	0.003555	7.07630457	0.001062	0	0.0018557	0	0.000402	0.028504021	0.00183516	14.7455803	69.40506944	0.034702535
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00450233	6.48836027	0.171901148	18.4624992	0.003325174	0	0.301245466	66.109207	0.0027843	15.96845613	0.008001	15.9262225	0.00239	0	0.0041765	0	0.000904	0.064152325	0.0041303	33.18701034	156.2059078	0.078102954
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.0024586	3.54311291	0.093870431	10.0818568	0.001815785	0	0.164501762	36.10039748	0.0015205	8.719929333	0.004369	8.69686673	0.001305	0	0.0022807	0	0.000494	0.035031798	0.00225544	18.12250243	85.29969751	0.042649849
	Travis	0.00051001	0.73497643	0.299602906	32.1779026	0.000376663	0	0.033939476	7.448118269	0.0003347	1.919585535	0.000906	1.80375688	0.000271	0	0.0004717	0	0.000103	0.007331583	0.00046734	3.755050799	47.84672212	0.023923361
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.00068596	0.9885511	0.00069182	0.07430275	0.000506616	0	0.001145408	0.251363264	0.0002999	1.719672794	9.88E-05	0.19675719	0.000977	0	0.0033962	0	0.001162	0.082452456	0.00624051	50.14257645	53.45567601	0.026727838
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	327.951674	0.004556851	0.4894142	0.168069652	0	0.007612767	1.670644221	0.0016809	9.640045808	0.001627	3.23835826	0.046792	0	0.0072464	0	0.001609	0.114197209	0.00828339	66.55721637	409.6615498	0.204830775
	San Patricio	0.05031335	72.507096	0.001007478	0.10820498	0.037158653	0	0.001683113	0.369364058	0.0003716	2.131325385	0.00036	0.7159712	0.010345	0	0.0016021	0	0.000356	0.025247952	0.00183138	14.71518784	90.57239744	0.045286199
Victoria Area	Victoria	0.02183674	31.4691479	0.002215582	0.2379576	0.016127403	0	0.003612695	0.792816643	0.0011996	6.879936985	0.000555	1.10557679	0.525456	0	0.0324127	0	0.000477	0.033835386	0.00225485	18.11775111	58.63702238	0.029318511
Other ERCOT counties	Andrews	2.4742E-05	0.03565607	2.49533E-05	0.00268003	1.82731E-05	0	4.13138E-05	0.009066428	1.082E-05	0.06202692	3.57E-06	0.00709684	3.52E-05	0	0.0001225	0	4.19E-05	0.00297398	0.00022509	1.808593816	1.928094084	0.000964047
	Angelina	0.00031082	0.44792583	0.000313473	0.03366758	0.000229554	0	0.000519	0.113896085	0.0001359	0.779206933	4.48E-05	0.08915334	0.000443	0	0.0015389	0	0.000527	0.03736032	0.00282766	22.72027757	24.22148766	0.012110744
	Bosque	0.00059539	0.8580253	0.001096604	0.11777724	0.000439723	0	0.001755208	0.385185651	0.0007356	4.218513294	0.000212	0.42260722	0.005709	0	0.0228507	0	0.000234	0.016635777	0.00106721	8.575036657	14.59378114	0.007296891
	Brazos	0.00193973	2.79535825	0.003572622	0.38370616	0.001432574	0	0.005718288	1.254895266	0.0023964	13.74348279	0.000692	1.37681089	0.018599	0	0.0744451	0	0.000764	0.054197652	0.00347685	27.9365882	47.5450392	0.02377252
	Calhoun	0.08269981	119.179558	0.001655986	0.17785599	0.061077496	0	0.002766524	0.60712189	0.0006108	3.503249079	0.000591	1.17683835	0.017004	0	0.0026334	0	0.000585	0.041499934	0.00301023	24.18728205	148.8734053	0.074436703
	Cameron	0.04837175	69.7090298	0.000968599	0.10402932	0.297964476	0	0.001618161	0.35511021	0.0003573	2.049077027	0.000346	0.6883417	0.009946	0	0.0015403	0	0.000342	0.024273627	0.00176071	14.1473252	87.07718688	0.043538593
	Cherokee	0.0035039	5.0495053	0.003533808	0.37953743	0.002587786	0	0.00585073	1.283960069	0.0015316	8.784064805	0.000505	1.005033	0.004992	0	0.0173479	0	0.005936	0.421166002	0.03187642	256.1275857	273.0508523	0.136525426
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.00129879	1.87169534	2.6007E-05	0.0027932	0.000959212	0	4.34478E-05	0.009534749	9.593E-06	0.05501795	9.28E-06	0.01848205	0.000267	0	4.136E-05	0	9.19E-06	0.00065175	4.7275E-05	0.379857283	2.338032321	0.001169016
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00353575	5.09540285	0.003565928	0.38298724	0.002611307	0	0.005903911	1.29563064	0.0015456	8.863907675	0.000509	1.01416826	0.005037	0	0.0175056	0	0.00599	0.424994195	0.03216616	258.4556607	275.5327516	0.137766376
	Fannin	0.00705631	10.1689288	0.007116546	0.76433015	0.005211403	0	0.011782473	2.58569855	0.0030845	17.68975857	0.001017	2.02398224	0.010052	0	0.034936	0	0.011954	0.848163698	0.06419422	515.8016539	549.8825159	0.274941258
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00367718	5.29921896	0.003708565	0.39830673	0.00271576	0	0.006140067	1.347455866	0.0016074	9.218463982	0.00053	1.05473499	0.005238	0	0.0182058	0	0.006229	0.441993963	0.03345281	268.7938871	286.5540616	0.143277031
	Frio	0.00858833	12.3767388	0.000871383	0.09358814	0.006342868	0	0.001420864	0.311812844	0.0004718	2.705862364	0.000218	0.43482065	0.206661	0	0.0127478	0	0.000188	0.013307374	0.00088683	7.125667131	23.06179727	0.011530899
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.18852746	271.688886	0.003775086	0.4054512	0.139235931	0	0.006306735	1.384031562	0.0013925	7.986217224	0.001348	2.68279145	0.038764	0	0.0060032	0	0.001333	0.094605746	0.00686231	55.13878236	339.3807654	0.169690383
	Howard	0.00055511	0.79997921	0.000559851	0.06012907	0.000409976	0	0.000926915	0.203414256	0.0002427	1.391635181	8E-05	0.15922461	0.000791	0	0.0027484	0	0.00094	0.066724169	0.00505009	40.57758761	43.2586941	0.021629347
	Jack	0.00212145	3.05724171	0.002139557	0.22979235	0.001566784	0	0.003542346	0.777378384	0.0009273	5.318344605	0.000306	0.60850096	0.003022	0	0.0105033	0	0.003594	0.254996517	0.0192997	155.0733964	165.3196509	0.082659825
	Jones	0.04071872	58.6801758	0.000815354	0.08757056	0.030072592	0	0.001362147	0.298927264	0.0003008	1.72488701	0.000291	0.5794373	0.008372	0	0.0012966	0	0.000288	0.020433231	0.00148214	11.90903866	73.30046986	0.036650235
	Lamar	0.00095084	1.37026235	0.000958954	0.10299343	0.000702236	0	0.001587687	0.348422674	0.0004156	2.383693562	0.000137	0.27273145	0.001355	0	0.0047076	0	0.001611	0.114289991	0.00865017	69.50423187	74.09662532	0.037048313
	Limestone	0.00071976	1.03724902	0.000891528	0.0957517	0.000531572	0	0.000300183	0.06587607	0.0054552	31.28595861	0.001239	2.46708783	0.000498	0	0.000316	0	0.000381	0.027031259	0.00052318	4.203752661	39.18270714	0.019591354
	Llano	0.00123817	1.78434542	0.047274044	5.07731915	0.000914447	0	0.082844655	18.1805041	0.0007657	4.391439486	0.0022	4.37982494	0.000657	0	0.0011486	0	0.000249	0.017642347	0.00113586	9.126664876	42.95774031	0.02147887
	McLennan	0.02453432	35.3566608	0.024743738	2.65752296	0.018119687	0	0.040966843	8.990294684	0.0107245	61.50606475	0.003535	7.03724599	0.034951	0	0.1214699	0	0.041562	2.949006404	0.22319886	1793.406609	1911.903404	0.955951702
	Milam	0.0022454	3.23587648	0.002264571	0.24321912	0.001658332	0	0.003749326	0.822800637	0.0009815	5.629095715	0.000324	0.64405569	0.003199	0	0.011117	0	0.003804	0.269895975	0.02042738	164.1343418	174.9792854	0.087489643
	Mitchell	0.01494317	21.5347565	0.015070721	1.61862315	0.011036196	0	0.024951762	5.475737881	0.006532	37.46162951	0.002153	4.28619037	0.021288	0	0.073984	0	0.025314	1.796157595	0.1359442	1092.313973	1164.487068	0.582243534
	Nolan	0.00056465	0.81372835	0.000569473	0.0611625	0.000417022	0	0.000942846	0.20691031	0.0002468	1.415553034	8.14E-05	0.16196118	0.000804	0	0.0027956	0	0.000957	0.067870949	0.00513689	41.27498932	44.00217564	0.022001088
	Palo Pinto	0.003207	4.62163881	0.005906709	0.63439141	0.002368511	0	0.009454195	2.074751119	0.003962	22.72245905	0.001144	2.2763174	0.03075	0	0.1230821	0	0.001263	0.089606394	0.00574838	46.18829092	78.6074551	0.039303728
	Pecos	4.0968E-05	0.05903895	4.13174E-05	0.00443756	3.02565E-05	0	6.84069E-05	0.015012095	1.791E-05	0.102703519	5.9E-06	0.01175087	5.84E-05	0	0.0002028	0	6.94E-05	0.004924284	0.0003727	2.994650527	3.192517809	0.001596259
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00073771	1.06311832	0.000835096	0.08969089	0.00054483	0	0.000735917	0.161499171	0.0031497	18.06369072	0.000731	1.4549065	0.000761	0	0.0018663	0	0.191633	13.59733179	0.00339774	27.30087742	61.73111481	0.030865557
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.00569644	8.2091954	0.005745061	0.61703013	0.004207073	0	0.009511781	2.087388457	0.00249	14.28062751	0.000821	1.63392487	0.008115	0	0.0282032	0	0.00965	0.68470747	0.05182285	416.3975025	443.9103763	0.221955188
	Tom Green	0.00148245	2.13637137	2.96846E-05	0.00318818	0.001094854	0	4.95918E-05	0.010883056	1.095E-05	0.062798026	1.06E-05	0.0210956	0.000305	0	4.72E-05	0	1.05E-05	0.000743913	5.396E-05	0.433572819	2.668652966	0.001334326
	Upton	3.1166E-05	0.04491383	3.14322E-05	0.00337587	2.30176E-05	0	5.20405E-05	0.011420439	1.362E-05	0.078131615	4.49E-06	0.00893947	4.44E-05	0	0.0001543	0	5.28E-05	0.003746145	0.00028353	2.278177843	2.428705209	0.001214353
	Ward	0.01855953	26.7463305	0.01871795	2.0103422	0.013707039	0	0.030990277	6.800907875	0.0081128	46.52762727	0.002674	5.32348086	0.02644	0	0.0918886	0	0.03144	2.230841322	0.16884373	1356.662218	1446.301748	0.723150874
	Webb	0.02001433	28.842856	0.000400768	0.04304324	0.014781473	0	0.00669531	0.146930644	0.0001478	0.847827517	0.000143	0.28480873	0.004115	0	0.0006373	0	0.000142	0.010043473	0.00072851	5.853606989	36.02911663	0.018014558
	Wharton	0.00014434	0.20800945	0.000178787	0.019202	0.000106601	0	6.01986E-05	0.013210757	0.001094	6.274071878	0.000249	0.49474867	9.99E-05	0	6.336E-05	0	7.64E-05	0.005420836	0.00010492	0.843018642	7.857682228	0.003928841
	Wichita	0.00020763	0.29922239	0.000209406	0.02249054	0.000153346	0	0.000346701	0.076084601	9.076E-05	0.520524029	2.99E-05	0.05955601	0.000296	0	0.001028	0	0.000352	0.024957355	0.00188893	15.17754772	16.18038264	0.008090191
	Wilbarger	0.02861682	41.2399954	0.000573025	0.06154394	0.021134796	0	0.000957307	0.21008388	0.0002114	1.212237891	0.000205	0.40722427	0.005884	0	0.0009112	0	0.000202	0.014360324	0.00104164	8.369584668	51.51503042	0.025757515
	Wise	0.00284449	4.09922072	0.002882008	0.30953296	0.002100781	0	0.00476997	1.046784106	0.0012561	7.203707179	0.000413	0.82261289	0.004182	0	0.0146143	0	0.004798	0.340439322	0.02576141	206.9933738	220.8156709	0.110407835
	Young	0.00623586	8.98655767	0.006289085	0.67545924	0.004605458	0	0.010412491	2.285051805	0.0027258	15.63291852	0.000899	1.78864789	0.008883	0	0.0308739	0	0.010564	0.74954522	0.05673017	455.8278846	485.9460649	0.242973032
	Total	**1.12183722**	**1616.69133**	**1.172570094**	**125.936183**	**1.090766584**	**0**	**1.189130767**	**260.9582582**	**1.62936**	**9344.528864**	**1.542363**	**3070.28223**	**1.359386**	**0**	**1.2316428**	**0**	**1.221806**	**86.69354703**	**1.52878695**	**12283.82891**	**26788.91933**	**13.39445966**

Energy Savings by PCA (MWh)																					
		1,441.11		107.40		0.00		219.45		5,735.09		1,990.64		0.00		0.00		70.96		8,035.02	

Table 46: 2007 Total OSD Electricity Savings from IECC / IRC by PCA for Multi-family Residences.

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West(ERCOT)/PCA	6.28
Austin Energy/PCA	0.65
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	1.33
Reliant Energy HL&P/PCA	32.81
San Antonio Public Service Bd /PCA	12.71
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	0.46
TXU Electric/PCA	55.90
El Paso Electric Co/PCA	0.03
Entergy Electric System/PCA	10.37
Total	120.54

Table 47: 2007 OSD NOx Reductions from IECC / IRC by PCA for Multi-family Residences by County using 2007 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.00957217	0.06012826	0.011806715	0.007693338	0.007069474	0	0.004263638	0.005674244	0.0710018	2.329892606	0.01614	0.205115331	0.006781	0	0.0051797	0	0.126288	0.05765735	0.008772	0.490345436	3.15650657	0.001578253
	Chambers	0.0218814	0.13744954	0.027103415	0.017660776	0.016160386	0	0.009125896	0.01214516	0.1658435	5.442082268	0.037677	0.478813226	0.015138	0	0.0096055	0	0.011582	0.00528766	0.015905	0.889119279	6.98255791	0.003491279
	Fort Bend	0.05569551	0.34985532	0.068987309	0.044952616	0.041133619	0	0.023228475	0.030913518	0.4221274	13.85193011	0.095902	1.218740736	0.038531	0	0.0244493	0	0.029479	0.01345887	0.040484	2.263107669	17.77295884	0.008886479
	Galveston	0.02755599	0.17309488	0.033893644	0.022085337	0.020351324	0	0.012791501	0.017023516	0.2014466	6.610385099	0.045813	0.582194659	0.019824	0	0.0167751	0	0.594657	0.27149298	0.028709	1.604890204	9.281166672	0.004640583
	Harris	0.07736057	0.48594594	0.09582276	0.062438785	0.057134232	0	0.032264145	0.042938603	0.5863312	19.24020811	0.133207	1.692820076	0.05352	0	0.0339599	0	0.040946	0.01869425	0.056232	3.143436486	24.68648225	0.012343241
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.00176365	0.01107849	0.003151138	0.002053303	0.001302533	0	0.005050143	0.006720961	0.0020858	0.068443035	0.000604	0.00767677	0.015958	0	0.0637888	0	0.000846	0.00038631	0.004013	0.224342749	0.320701612	0.000160351
	Dallas	0.00504555	0.031694	0.005305276	0.003456955	0.003726366	0	0.008757286	0.011654598	0.0024131	0.079184409	0.000782	0.009941159	0.00931	0	0.033672	0	0.008209	0.00374794	0.044002	2.459770808	2.599449865	0.001299725
	Denton	0.00063576	0.00399356	0.001170951	0.000763	0.000469535	0	0.001874207	0.002494281	0.0007854	0.025773577	0.000227	0.002880833	0.006096	0	0.0243999	0	0.00025	0.0001143	0.00114	0.063702795	0.099722341	4.98612E-05
	Tarrant	0.01557224	0.09781815	0.015705165	0.010233596	0.011500796	0	0.026002176	0.034604888	0.006807	0.223368296	0.002244	0.028514924	0.022184	0	0.0770985	0	0.02638	0.01204373	0.141667	7.91935098	8.325934562	0.004162967
	Ellis	0.00350282	0.02200324	0.003532723	0.002301947	0.002586991	0	0.005848935	0.007784031	0.0015312	0.050244511	0.000505	0.006414153	0.00499	0	0.0173426	0	0.005934	0.00270912	0.031867	1.781380448	1.872837443	0.000936419
	Johnson	0.00033718	0.002118	0.000621017	0.000404659	0.00024902	0	0.000993991	0.001322849	0.0004166	0.013669092	0.00012	0.001527858	0.003233	0	0.0129406	0	0.000133	6.0618E-05	0.000604	0.033784965	0.052888038	2.6444E-05
	Kaufman	0.00649275	0.04078469	0.006548174	0.004266836	0.004795187	0	0.01084145	0.014428298	0.0028381	0.093132058	0.000936	0.011889125	0.009249	0	0.0321458	0	0.010999	0.00502156	0.059067	3.301925439	3.471448002	0.001735724
	Parker	0.00047595	0.00298972	0.000876616	0.000571209	0.000351511	0	0.0014031	0.00186731	0.000588	0.019295044	0.00017	0.002156697	0.004564	0	0.0182667	0	0.000187	8.5568E-05	0.000853	0.047690247	0.074655799	3.73279E-05
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00095027	0.0059692	0.000958382	0.000624489	0.000701818	0	0.001586741	0.002111708	0.0004154	0.01363069	0.000137	0.001740077	0.001354	0	0.0047048	0	0.00161	0.00073495	0.008645	0.483265632	0.50807674	0.000254038
	Hood	0.01232788	0.07743847	0.012433111	0.008101502	0.00910469	0	0.020584816	0.027395216	0.0053888	0.17683117	0.001776	0.022574051	0.017562	0	0.0610356	0	0.020884	0.0095345	0.112152	6.269412995	6.591287907	0.003295644
	Hunt	0.00635121	0.03989559	0.006405424	0.004173819	0.004690653	0	0.010605108	0.014113763	0.0027763	0.09110179	0.000915	0.011629943	0.009048	0	0.031445	0	0.010759	0.00491209	0.05778	3.229943833	3.395770823	0.001697885
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.03112811	0.19553346	0.048234164	0.031429721	0.0229895	0	0.084461674	0.112405467	0.0010637	0.034905997	1.065347	13.53864102	0.043667	0	0.0043501	0	0.000484	0.00022099	0.002333	0.130394397	14.04353106	0.007021766
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200761	0.01261095	0.076651484	0.049946646	0.00148271	0	0.134326688	0.178768112	0.0012416	0.040740946	0.003567	0.045336381	0.001066	0	0.0018623	0	0.000403	0.00018406	0.001842	0.102954075	0.43054117	0.000215271
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.00446951	0.02807557	0.170648096	0.1111955	0.003300936	0	0.299049574	0.397988876	0.002764	0.090700981	0.007942	0.100931732	0.002372	0	0.0041461	0	0.000898	0.00040977	0.0041	0.229205177	0.958507612	0.000479254
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.00246935	0.01551142	0.094281013	0.061434171	0.001823727	0	0.165221279	0.21988405	0.0015271	0.050111197	0.004388	0.055763564	0.001311	0	0.0022907	0	0.000496	0.00022639	0.002265	0.126633093	0.529563885	0.000264782
	Travis	0.00050761	0.00318858	0.298194277	0.194305489	0.000374892	0	0.033779905	0.044955845	0.0003331	0.010931686	0.000902	0.011461028	0.00027	0	0.0004695	0	0.000103	4.6953E-05	0.000465	0.026001759	0.290891341	0.000145446
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22352453	1.4040852	0.00447587	0.002916508	0.165082827	0	0.007477478	0.00995137	0.001651	0.05417739	0.001598	0.020306252	0.04596	0	0.0071176	0	0.001581	0.00072173	0.008136	0.4548219	1.946980352	0.00097349
	San Patricio	0.05533089	0.3475649	0.001107949	0.000721948	0.040864326	0	0.001850962	0.002463346	0.0004087	0.01341098	0.000396	0.005026576	0.011377	0	0.0017619	0	0.000391	0.00017866	0.002014	0.11258585	0.481952251	0.000240976
Victoria Area	Victoria	0.02060475	0.12943022	0.002090584	0.001362239	0.015217528	0	0.003408874	0.004536686	0.0011319	0.037144158	0.000524	0.006659795	0.495811	0	0.0305841	0	0.00045	0.00020543	0.002128	0.118937166	0.298275688	0.000149138
Other ERCOT counties	Andrews	2.5653E-05	0.00016114	2.58716E-05	1.68581E-05	1.89456E-05	0	4.28342E-05	5.70058E-05	1.121E-05	0.000367962	3.7E-06	4.69736E-05	3.65E-05	0	0.000127	0	4.35E-05	1.984E-05	0.000233	0.013045805	0.013715583	6.85779E-06
	Angelina	0.00032149	0.00201946	0.000324234	0.000211273	0.000237435	0	0.000536817	0.000714421	0.0001405	0.004611456	4.63E-05	0.000588693	0.000458	0	0.0015917	0	0.000545	0.00024864	0.002925	0.163495613	0.171889562	8.59448E-05
	Bosque	0.00093945	0.00590124	0.001730301	0.001127477	0.000693828	0	0.002769496	0.003685772	0.0011606	0.038085345	0.000335	0.004256977	0.009008	0	0.0360555	0	0.00037	0.0001689	0.001684	0.094132955	0.147358661	7.36793E-05
	Brazos	0.00191393	0.01202246	0.003525105	0.002296983	0.00141352	0	0.005642234	0.007508943	0.0023645	0.077590438	0.000682	0.008672645	0.018351	0	0.073455	0	0.000754	0.00034409	0.003431	0.191775004	0.300210569	0.000150105
	Calhoun	0.08852525	0.55607763	0.001772635	0.001155062	0.065379841	0	0.0029614	0.003941167	0.0006539	0.021456557	0.000633	0.008042142	0.018202	0	0.0028189	0	0.000626	0.00028584	0.003222	0.180128872	0.771087264	0.000385544
	Cameron	0.05467229	0.34342786	0.001094762	0.000713354	0.285623104	0	0.001828931	0.002434025	0.0004038	0.013251351	0.000391	0.004966745	0.011242	0	0.0017409	0	0.000387	0.00017653	0.00199	0.111245751	0.476215617	0.000238108
	Cherokee	0.003513	0.02206713	0.003542982	0.002308632	0.002594504	0	0.005865919	0.007806634	0.0015356	0.050390411	0.000506	0.006432778	0.005005	0	0.0173929	0	0.005951	0.00271698	0.031959	1.78655323	1.878275798	0.000939138
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.0013551	0.00851215	2.71346E-05	1.76811E-05	0.001000801	0	4.53316E-05	6.03294E-05	1.001E-05	0.000328446	9.69E-06	0.000123105	0.000279	0	4.315E-05	0	9.58E-06	4.3754E-06	4.93E-05	0.002757321	0.011803411	5.90171E-06
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00362926	0.02279748	0.003660242	0.00238504	0.002680373	0	0.006060061	0.008065008	0.0015864	0.052058166	0.000523	0.006645682	0.00517	0	0.0179686	0	0.006148	0.00280691	0.033017	1.845682191	1.94044047	0.00097022
	Fannin	0.00762852	0.04791907	0.007693632	0.005013225	0.005633999	0	0.012737922	0.016952211	0.0033346	0.109423455	0.001099	0.013968865	0.010867	0	0.0377689	0	0.012923	0.00589997	0.0694	3.879524363	4.078701154	0.002039351
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00377443	0.02370938	0.003806652	0.002480441	0.002787588	0	0.006302464	0.008387608	0.0016499	0.054140492	0.000544	0.006911509	0.005377	0	0.0186873	0	0.006394	0.00291918	0.034338	1.919509478	2.018058089	0.001009029
	Frio	0.01476384	0.0927401	0.001497957	0.000976079	0.010903753	0	0.002442547	0.003250653	0.0008111	0.026614751	0.000375	0.004771916	0.355262	0	0.0219143	0	0.000322	0.00014719	0.001525	0.085221559	0.213722252	0.000106861
	Grimes	0.00055442	0.00348266	0.001021149	0.000665388	0.000409467	0	0.001634436	0.002175183	0.0006849	0.022476318	0.000198	0.002512283	0.005316	0	0.0212784	0	0.000218	9.9676E-05	0.000994	0.055553187	0.08696469	4.34823E-05
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.239737	1.50592498	0.004800509	0.003128046	0.177056459	0	0.008019827	0.010673154	0.0017708	0.058106934	0.001714	0.021779086	0.049294	0	0.0076338	0	0.001695	0.00077408	0.008726	0.487810614	2.088196896	0.001044098
	Howard	0.00058508	0.00367523	0.000590075	0.000384497	0.000432108	0	0.000976955	0.001300176	0.0002558	0.008392401	8.43E-05	0.001071364	0.000833	0	0.0028967	0	0.000991	0.00045251	0.005323	0.297546131	0.312822303	0.000156411
	Jack	0.00217756	0.01367849	0.002196145	0.001431024	0.001608224	0	0.003636037	0.004839005	0.0009519	0.031234899	0.000314	0.003987409	0.003102	0	0.0107811	0	0.003689	0.00168414	0.01981	1.107409314	1.164264282	0.000582132
	Jones	0.04250012	0.26696755	0.000851025	0.000554534	0.031388236	0	0.00142174	0.001892117	0.0003139	0.010301088	0.000304	0.003860955	0.008739	0	0.0013533	0	0.000301	0.00013723	0.001547	0.086478148	0.370191618	0.000185096
	Lamar	0.00107998	0.00678397	0.001089199	0.00070973	0.000797614	0	0.001803327	0.00239995	0.0004721	0.015491242	0.000156	0.001977593	0.001539	0	0.005347	0	0.00183	0.00083527	0.009825	0.549230077	0.577427833	0.000288714
	Limestone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Llano	0.00124346	0.00781088	0.047475864	0.030935607	0.000918351	0	0.083198331	0.110724152	0.000769	0.025233844	0.00221	0.028080133	0.00066	0	0.0011535	0	0.00025	0.000114	0.001141	0.06376698	0.266665599	0.000133333
	McLennan	0.02303137	0.14467318	0.023227961	0.015135502	0.017009692	0	0.038457253	0.051180675	0.0100675	0.330362006	0.003319	0.04217361	0.03281	0	0.1140288	0	0.039015	0.01781269	0.209526	11.71273061	12.31406826	0.006157034
	Milam	0.00165249	0.01038025	0.001666598	0.001085967	0.001220439	0	0.002759294	0.003672194	0.0007223	0.023703351	0.000238	0.003025941	0.002354	0	0.0081815	0	0.002799	0.00127805	0.015033	0.840384055	0.883529807	0.000441765
	Mitchell	0.01696145	0.10654457	0.017106233	0.011146542	0.012526789	0	0.028321847	0.037692012	0.0074142	0.243295124	0.002444	0.031058758	0.024163	0	0.0839765	0	0.028733	0.01311815	0.154305	8.625841335	9.068696498	0.004534348
	Nolan	0.00060327	0.0037895	0.000608422	0.000396452	0.000445544	0	0.001007331	0.001340603	0.0002637	0.008653348	8.69E-05	0.001104676	0.000859	0	0.0029868	0	0.001022	0.00046658	0.005488	0.306797786	0.322548944	0.000161274
	Palo Pinto	0.00307488	0.01931507	0.00566337	0.003690292	0.002270935	0	0.00906471	0.012063732	0.0037988	0.124655388	0.001096	0.013933314	0.029483	0	0.1180115	0	0.001211	0.00055281	0.005512	0.308102239	0.482312849	0.000241156
	Pecos	4.2262E-05	0.00026547	4.26225E-05	2.77731E-05	3.12122E-05	0	7.05678E-05	9.39148E-05	1.847E-05	0.000606203	6.09E-06	7.73871E-05	6.02E-05	0	0.0002092	0	7.16E-05	3.2686E-05	0.000384	0.021492464	0.022595899	1.12979E-05
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00035926	0.0022567	0.000406685	0.000264999	0.000265328	0	0.000358385	0.000476956	0.0015339	0.050333179	0.000356	0.004523232	0.000371	0	0.0009089	0	0.093323	0.04260721	0.001655	0.092497866	0.192960145	9.64801E-05
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tom Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upton	3.2238E-05	0.0002025	3.25131E-05	2.11858E-05	2.38092E-05	0	5.38302E-05	7.16397E-05	1.409E-05	0.000462421	4.65E-06	5.90321E-05	4.59E-05	0	0.0001596	0	5.46E-05	2.4933E-05	0.000293	0.016394789	0.017236506	8.61825E-06
	Ward	0.01980763	0.12442301	0.0199767	0.013016958	0.014628815	0	0.033074321	0.044016822	0.0086584	0.284120632	0.002854	0.036270493	0.028218	0	0.098068	0	0.033554	0.01531941	0.180198	10.07327828	10.59044561	0.005295223
	Webb	0.01418005	0.08907296	0.000283942	0.000185019	0.010472596	0	0.000474359	0.000631299	0.0001047	0.003436929	0.000101	0.001288197	0.002916	0	0.0004515	0	0.0001	4.5786E-05	0.000516	0.028853189	0.123513383	6.17567E-05
	Wharton	0.00015439	0.00096981	0.000191235	0.00012461	0.000114024	0	6.43902E-05	8.56934E-05	0.0011702	0.038398054	0.000266	0.003378394	0.000107	0	6.777E-05	0	8.17E-05	3.7308E-05	0.000112	0.006273417	0.049267288	2.46336E-05
	Wichita	0.00021984	0.00138096	0.000221719	0.000144474	0.000162364	0	0.000367089	0.000488539	9.61E-05	0.003153428	3.17E-05	0.000402563	0.000313	0	0.0010884	0	0.000372	0.00017003	0.002	0.111802353	0.117542344	5.87712E-05
	Wilbarger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wise	0.00291847	0.01833258	0.002955932	0.001926106	0.002155421	0	0.004892446	0.006511091	0.0012878	0.042257066	0.000424	0.005384788	0.004281	0	0.0149528	0	0.004924	0.00224823	0.026441	1.478054767	1.554714635	0.000777357
	Young	0.00549666	0.03452766	0.005543579	0.003612235	0.004059529	0	0.009178198	0.012214766	0.0024027	0.078844107	0.000792	0.010065142	0.00783	0	0.0272141	0	0.009311	0.00425117	0.050005	2.795357129	2.938872213	0.001469436
	Total	**1.14303735**	**7.18007041**	**1.154658244**	**0.752383434**	**1.089429227**	**0**	**1.180868675**	**1.571554145**	**1.5393506**	**50.51313199**	**1.443965**	**18.35019835**	**1.481727**	**0**	**1.2697054**	**0**	**1.151969**	**0.52593618**	**1.517783**	**84.84573025**	**163.7390048**	**0.081869502**

Energy Savings by PCA (MWh)																					
		6.28		0.65		0.00		1.33		32.81		12.71		0.00		0.00		0.46		55.90	

6.1.3 2007 Results for New Residential Construction (Single-family and Multi-family), using 1999 Base Year and 2007 eGRID.

In Table 48 and Table 49, the combined NOx emissions reductions are listed from single-family electricity savings, multi-family electricity savings, and natural gas savings (single-family and multi-family), which also show the 2007 annual and OSD electricity savings are shown for the combined single-family and multi-family savings.

Using the 2007 eGRID the total NOx reductions from electricity and natural gas savings from new construction in 2007 are calculated to be 265.42 tons NOx/year, which represents 217.18 tons NOx/year (81.8%) from single-family residential electricity savings, 13.39 tons NOx/year (5.0%) from multi-family residential electricity savings, and 34.85 tons NOx/year (13.1%) from natural gas savings from single-family and multi-family residential. On a peak Ozone Season Day (OSD), the NOx reductions in 2007 are calculated to be 1.43 tons of NOx/day, which represents 1.27 tons NOx/day (88.8%) from single-family residential electricity savings, 0.08 tons NOx/day (5.6%) from multi-family residential electricity savings, and 0.08 tons NOx/day (5.6%) from natural gas savings from single-family and multi-family residential.

Figure 93 through Figure 98 show the electricity and NOx reductions tabulated in Table 48 and Table 49. Figure 93 shows the annual electricity savings by county as a stacked bar chart, and Figure 94 shows the OSD electricity savings by county in a similar fashion. Figure 95 shows the spatial distribution of the electricity savings by county across the state.

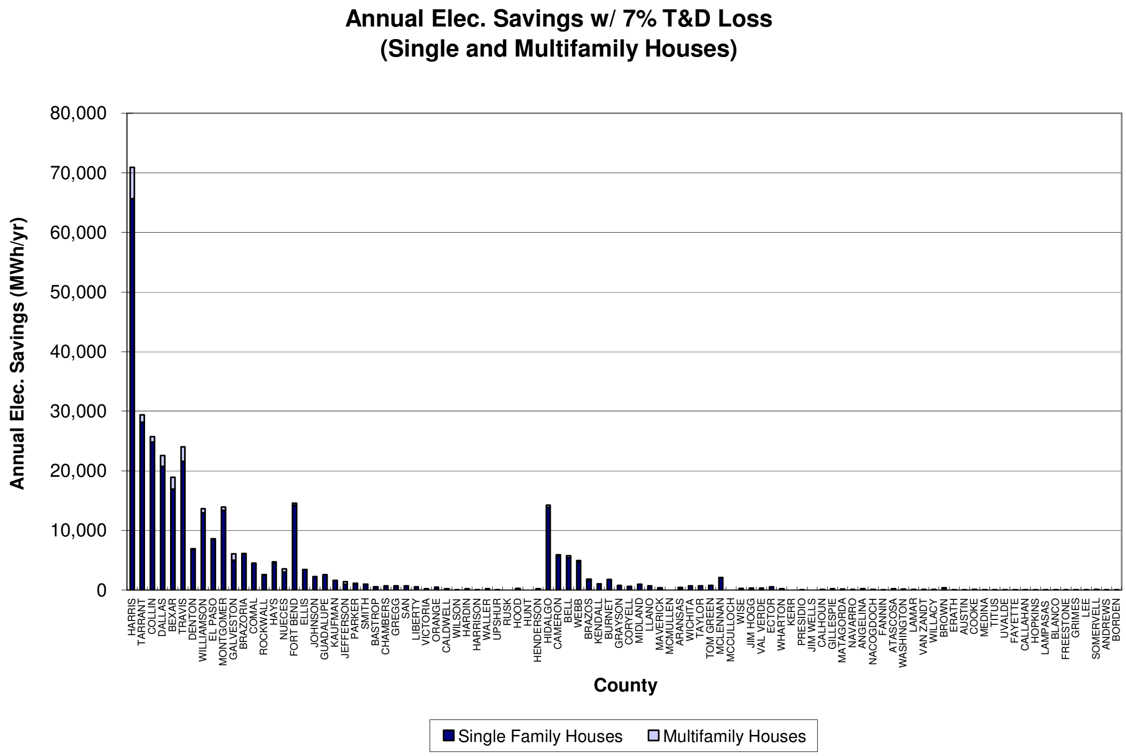
Figure 96 shows the annual NOx reductions in a similar format at the electricity savings using a stacked bar chart with the ordering of the counties determined by Figure 93. Figure 97 shows the OSD NOx reductions, also as a stacked bar chart, and Figure 98 shows the spatial distribution of the NOx savings by county across the state.

Table 48: 2007 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (Using 1999 Base year and 2007 eGRID) (1).

	Electricity Savings and Resultant NOx Reductions (Single Family Houses)				Electricity Savings and Resultant NOx Reductions (Multifamily Houses)				Total Electricity Savings and Resultant NOx Reductions (Single and Multi-Family Houses)				Total Natural Gas Savings and Resultant NOx Reductions (Single and Multi-Family Houses)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
HARRIS	65,647.69	27.50	400.15	0.19	5,252.69	1.86	30.07	0.01	70,900.39	29.36	430.2239	0.1982	1,376,626.63	6.33	3,369.5967	0.0155	35.69	0.2137
TARRANT	28,132.82	8.36	180.44	0.07	1,242.32	0.47	9.71	0.00	29,375.14	8.84	190.1449	0.0701	752,210.77	3.46	1,452.1868	0.0067	12.30	0.0768
COLLIN	24,834.07	0.44	156.77	0.00	902.39	0.03	7.04	0.00	25,736.46	0.47	163.8171	0.0027	641,108.09	2.95	1,232.9100	0.0057	3.42	0.0084
DALLAS	20,705.44	3.06	132.80	0.02	1,831.31	0.17	14.31	0.00	22,536.74	3.23	147.1124	0.0219	574,960.75	2.64	1,134.6367	0.0052	5.88	0.0271
BEXAR	16,939.24	14.99	99.40	0.08	1,976.11	1.19	12.63	0.01	18,915.36	16.18	112.0316	0.0886	413,314.56	1.90	1,065.9142	0.0049	18.08	0.0935
TRAVIS	21,595.62	0.32	126.05	0.00	2,436.77	0.02	14.83	0.00	24,032.39	0.35	140.8808	0.0020	458,958.94	2.11	1,110.5232	0.0051	2.46	0.0071
DENTON	6,792.04	0.10	43.44	0.00	133.94	0.01	0.87	0.00	6,925.98	0.10	44.3115	0.0008	192,966.38	0.89	326.2328	0.0015	0.99	0.0023
WILLIAMSON	12,941.58	0.00	75.54	0.00	679.89	0.00	4.14	0.00	13,621.48	0.00	79.6708	0.0000	258,860.12	1.19	619.2333	0.0028	1.19	0.0028
EL PASO	8,518.39	0.00	38.56	0.00	93.37	0.00	0.51	0.00	8,611.76	0.00	39.0729	0.0000	223,490.63	1.03	397.4210	0.0018	1.03	0.0018
MONTGOMERY	13,355.07	0.00	78.55	0.00	577.38	0.00	3.30	0.00	13,932.45	0.00	81.8488	0.0000	293,242.30	1.35	720.5720	0.0033	1.35	0.0033
GALVESTON	4,991.38	14.31	28.76	0.07	1,065.91	0.95	6.11	0.00	6,057.29	15.26	34.8635	0.0753	116,419.66	0.54	316.6934	0.0015	15.80	0.0768
BRAZORIA	6,005.36	3.70	34.60	0.02	117.78	0.25	0.68	0.00	6,123.15	3.95	35.2754	0.0255	115,783.33	0.53	311.1800	0.0014	4.48	0.0269
COMAL	4,551.31	0.00	26.71	0.00	0.00	0.00	0.00	0.00	4,551.31	0.00	26.7082	0.0000	98,477.38	0.45	249.9788	0.0011	0.45	0.0011
ROCKWALL	2,560.19	0.00	16.37	0.00	12.29	0.00	0.08	0.00	2,572.48	0.00	16.4539	0.0000	71,932.10	0.33	120.7968	0.0006	0.33	0.0006
HAYS	4,492.79	0.75	26.22	0.00	207.52	0.04	1.26	0.00	4,700.31	0.80	27.4879	0.0047	89,316.23	0.41	213.3410	0.0010	1.21	0.0057
NUECES	3,011.93	4.45	14.73	0.02	544.20	0.20	2.68	0.00	3,556.14	4.65	17.4136	0.0233	64,225.92	0.30	169.3271	0.0008	4.95	0.0241
FORT BEND	14,242.77	28.37	83.77	0.13	346.55	1.92	1.98	0.01	14,589.32	30.29	85.7536	0.1427	307,204.33	1.41	752.5656	0.0035	31.70	0.1461
ELLIS	3,470.00	2.26	22.26	0.01	2.61	0.13	0.02	0.00	3,472.61	2.38	22.2761	0.0158	89,280.34	0.41	168.3199	0.0008	2.79	0.0166
JOHNSON	2,261.96	0.06	14.51	0.00	19.55	0.00	0.15	0.00	2,281.51	0.06	14.6606	0.0004	58,613.88	0.27	111.0031	0.0005	0.33	0.0010
GUADALUPE	2,583.42	0.61	15.16	0.00	0.00	0.03	0.00	0.00	2,583.42	0.65	15.1601	0.0038	55,897.94	0.26	141.8935	0.0007	0.91	0.0045
KAUFMAN	1,551.18	4.35	9.92	0.03	45.02	0.25	0.29	0.00	1,596.20	4.60	10.2137	0.0292	44,377.39	0.20	75.3373	0.0003	4.80	0.0296
JEFFERSON	997.58	0.00	5.65	0.00	414.29	0.00	2.37	0.00	1,411.87	0.00	8.0202	0.0000	28,749.13	0.13	74.2032	0.0003	0.13	0.0003
PARKER	1,052.05	0.05	6.73	0.00	75.39	0.00	0.49	0.00	1,127.43	0.05	7.2200	0.0006	31,036.04	0.14	53.6555	0.0002	0.19	0.0009
SMITH	943.78	0.00	6.52	0.00	33.60	0.00	0.26	0.00	977.37	0.00	6.7761	0.0000	27,974.87	0.13	55.7017	0.0003	0.13	0.0003
BASTROP	506.65	1.38	2.91	0.01	29.43	0.08	0.18	0.00	536.09	1.46	3.0920	0.0085	8,971.27	0.04	22.6879	0.0001	1.50	0.0086
CHAMBERS	676.39	8.77	3.84	0.05	0.00	0.59	0.00	0.00	676.39	9.36	3.8388	0.0561	13,883.95	0.06	34.0474	0.0002	9.42	0.0562
GREGG	623.21	0.00	4.22	0.00	89.91	0.00	0.58	0.00	713.12	0.00	4.7963	0.0000	19,745.13	0.09	37.9469	0.0002	0.09	0.0002
SAN PATRICIO	701.00	0.98	3.43	0.01	0.00	0.05	0.00	0.00	701.00	1.03	3.4291	0.0058	12,688.41	0.06	33.0296	0.0002	1.09	0.0059
LIBERTY	530.07	0.00	3.11	0.00	0.00	0.00	0.00	0.00	530.07	0.00	3.1123	0.0000	11,112.35	0.05	27.1084	0.0001	0.05	0.0001
VICTORIA	210.96	0.59	1.29	0.00	0.00	0.03	0.00	0.00	210.96	0.62	1.2895	0.0031	5,093.75	0.02	13.2304	0.0001	0.64	0.0032
ORANGE	509.00	0.00	2.89	0.00	4.80	0.00	0.03	0.00	513.80	0.00	2.9152	0.0000	10,590.05	0.05	25.8163	0.0001	0.05	0.0001
CALDWELL	186.73	0.00	1.06	0.00	0.00	0.00	0.00	0.00	186.73	0.00	1.0634	0.0000	3,214.95	0.01	8.4773	0.0000	0.01	0.0000
WILSON	73.50	0.00	0.43	0.00	0.00	0.00	0.00	0.00	73.50	0.00	0.4313	0.0000	1,590.27	0.01	4.0368	0.0000	0.01	0.0000
HARDIN	237.93	0.00	1.35	0.00	0.00	0.00	0.00	0.00	237.93	0.00	1.3491	0.0000	4,866.93	0.02	11.9351	0.0001	0.02	0.0001
HARRISON	65.33	0.00	0.45	0.00	0.00	0.00	0.00	0.00	65.33	0.00	0.4450	0.0000	1,930.47	0.01	3.5158	0.0000	0.01	0.0000
WALLER	162.05	0.00	0.95	0.00	60.94	0.00	0.35	0.00	222.99	0.00	1.3018	0.0000	4,674.50	0.02	11.9538	0.0001	0.02	0.0001
UPSHUR	23.97	0.00	0.16	0.00	21.49	0.00	0.14	0.00	45.46	0.00	0.3011	0.0000	1,182.61	0.01	2.5355	0.0000	0.01	0.0000
RUSK	11.25	0.47	0.08	0.00	0.00	0.03	0.00	0.00	11.25	0.50	0.0757	0.0000	357.39	0.00	0.7402	0.0000	0.50	0.0000
HOOD	270.77	8.61	1.74	0.05	0.00	0.49	0.00	0.00	270.77	9.10	1.7366	0.0555	6,961.92	0.03	13.1196	0.0001	9.13	0.0556
HUNT	0.00	4.25	0.00	0.03	4.11	0.24	0.03	0.00	4.11	4.50	0.0267	0.0286	86.06	0.00	0.2340	0.0000	4.50	0.0286
HENDERSON	218.83	0.56	1.51	0.00	2.60	0.03	0.02	0.00	221.43	0.60	1.5315	0.0043	6,754.06	0.03	12.3073	0.0001	0.63	0.0043
HIDALGO	13,870.69	3.68	66.39	0.02	382.98	0.17	1.25	0.00	14,253.66	3.85	67.6406	0.0250	241,538.74	1.11	663.1308	0.0031	4.97	0.0281
CAMERON	5,758.25	0.95	27.56	0.01	179.11	0.04	0.58	0.00	5,937.37	0.99	28.1458	0.0057	100,783.95	0.46	276.7370	0.0013	1.45	0.0070
BELL	5,436.74		32.75		289.29		1.62		5,726.03	0.00	34.3648	0.0000	144,548.23	0.66	291.0827	0.0013	0.66	0.0013
WEBB	4,754.16	0.39	21.97	0.00	210.99	0.02	1.04	0.00	4,965.15	0.41	23.0135	0.0015	77,825.16	0.36	206.5093	0.0009	0.77	0.0024
BRAZOS	1,588.13	0.40	9.34	0.00	260.05	0.02	1.49	0.00	1,848.19	0.43	10.8294	0.0025	38,861.45	0.18	97.1636	0.0004	0.60	0.0030
KENDALL	1,027.04		6.11		33.78		0.12		1,060.82	0.00	6.2290	0.0000	26,404.28	0.12	58.1984	0.0003	0.12	0.0003
BURNET	1,795.31		10.48		9.49		0.06		1,804.80	0.00	10.5364	0.0000	34,157.52	0.16	80.8939	0.0004	0.16	0.0004
GRAYSON	755.85		4.78		36.96		0.24		792.81	0.00	5.0215	0.0000	19,922.22	0.09	37.9326	0.0002	0.09	0.0002
CORYELL	577.41		3.48		29.71		0.17		607.12	0.00	3.6440	0.0000	15,311.64	0.07	30.7832	0.0001	0.07	0.0001
MIDLAND	971.90		4.63		0.00		0.00		971.90	0.00	4.6283	0.0000	31,683.06	0.15	47.4324	0.0002	0.15	0.0002
LLANO	663.09	0.38	3.87	0.00	0.00	0.02	0.00	0.00	663.09	0.40	3.8702	0.0024	12,543.41	0.06	29.6705	0.0001	0.46	0.0025
MAVERICK	411.49		1.90		0.00		0.00		411.49	0.00	1.9020	0.0000	6,410.36	0.03	16.9546	0.0001	0.03	0.0001
MCMULLEN	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
ARANSAS	418.21		2.05		7.44		0.04		425.65	0.00	2.0824	0.0000	7,703.00	0.04	20.0812	0.0001	0.04	0.0001
WICHITA	678.21	0.14	3.87	0.00	6.36	0.01	0.03	0.00	684.57	0.15	3.8992	0.0010	26,694.40	0.12	31.2808	0.0001	0.27	0.0011
TAYLOR	702.48	0.00	3.67	0.00	3.38	0.00	0.02	0.00	705.87	0.00	3.6813	0.0000	22,407.39	0.10	32.7697	0.0002	0.10	0.0002
TOM GREEN	748.40	0.03	3.92	0.00	20.34	0.00	0.13	0.00	768.73	0.03	4.0576	0.0000	22,396.05	0.10	40.0475	0.0002	0.13	0.0002
MCLENNAN	2,071.76	16.87	12.48	0.10	17.21	0.96	0.10	0.01	2,088.97	17.83	12.5746	0.1037	51,407.19	0.24	98.9044	0.0005	18.06	0.1042
MCCULLOCH	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
WISE	248.77	1.95	1.57	0.01	9.20	0.11	0.07	0.00	257.97	2.06	1.6423	0.0131	6,425.91	0.03	12.3619	0.0001	2.09	0.0132
JIM HOGG	342.89		4.03		0.00		0.00		342.89	0.00	4.0323	0.0000	42,416.26	0.20	67.4992	0.0003	0.20	0.0003
VAL VERDE	284.80		1.67		43.67		0.28		328.47	0.00	1.9504	0.0000	7,196.49	0.03	18.6378	0.0001	0.03	0.0001
ECTOR	539.72	2.43	2.57	0.02	0.00	0.14	0.00	0.00	539.72	2.57	2.5702	0.0163	17,594.21	0.08	26.3401	0.0001	2.65	0.0165
WHARTON	215.38	0.06	1.32	0.00	6.36	0.00	0.04	0.00	221.74	0.06	1.3553	0.0004	5,346.18	0.02	13.9291	0.0001	0.09	0.0005
KERR	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
PRESIDIO	64.90	0.00	0.34	0.00	0.34	0.00	0.00	0.00	65.24	0.00	0.3425	0.0000	1,885.39	0.01	3.2762	0.0000	0.01	0.0000
JIM WELLS	0.00		0.00		0.93		0.00		0.93	0.00	0.0046	0.0000	16.58	0.00	0.0468	0.0000	0.00	0.0000
CALHOUN	141.62	1.62	0.87	0.01	0.00	0.07	0.00	0.00	141.62	1.69	0.8656	0.0092	3,419.58	0.02	8.8819	0.0000	1.71	0.0093
GILLESPIE	171.41		1.00		22.54		0.14		193.95	0.00	1.1377	0.0000	3,709.07	0.02	9.0037	0.0000	0.02	0.0000
MATAGORDA	157.85		0.96		0.00		0.00		157.85	0.00	0.9648	0.0000	3,811.41	0.02	9.8996	0.0000	0.02	0.0000
NAVARRO	101.64		0.61		14.13		0.08		115.77	0.00	0.6913	0.0000	3,046.91	0.01	6.5684	0.0000	0.01	0.0000
ANGELINA	180.04	0.21	1.21	0.00	15.70	0.01	0.12	0.00	195.74	0.23	1.3290	0.0014	6,158.72	0.03	13.1764	0.0001	0.25	0.0015
NACOGDOCHES	73.14		0.49		56.20		0.42		129.34	0.00	0.9147	0.0000	3,899.64	0.02	9.5846	0.0000	0.02	0.0000
FANNIN	70.26	4.85	0.44	0.03	4.52	0.27	0.03	0.00	74.78	5.13	0.4738	0.0344	1,874.59	0.01	3.5878	0.0000	5.14	0.0344
ATASCOSA	218.15		1.28		0.00		0.00		218.15	0.00	1.2791	0.0000	4,647.13	0.02	12.0095	0.0001	0.02	0.0001
WASHINGTON	144.05		0.85		15.64		0.09		159.69	0.00	0.9368	0.0000	3,359.54	0.02	8.3376	0.0000	0.02	0.0000
LAMAR	105.67	0.65	0.72	0.00	6.24	0.04	0.05	0.00	111.91	0.69	0.7693	0.0049	3,323.23	0.02	6.1808	0.0000	0.71	0.0049
VAN ZANDT	107.23		0.68		0.00		0.00		107.23	0.00	0.6769	0.0000	2,677.73	0.01	5.0460	0.0000	0.01	0.0000
WILLACY	84.80		0.41		0.00		0.00		84.80	0.00	0.4059	0.0000	1,417.09	0.01	3.8858	0.0000	0.01	0.0000
BROWN	393.59		2.37		10.87		0.06		404.46	0.00	2.4314	0.0000	10,066.52	0.05	19.7714	0.0001	0.05	0.0001
ERATH	61.28		0.32		3.38		0.02		64.66	0.00	0.3349	0.0000	2,059.77	0.01	3.2002	0.0000	0.01	0.0000
AUSTIN	70.22		0.41		1.96		0.01		72.18	0.00	0.4242	0.0000	1,519.80	0.01	3.7253	0.0000	0.01	0.0000
COOKE	55.36		0.35		60.77		0.40		116.13	0.00	0.7458	0.0000	2,676.03	0.01	6.0871	0.0000	0.01	0.0000
MEDINA	56.96		0.33		0.00		0.00		56.96	0.00	0.3343	0.0000	1,232.46	0.01	3.1285	0.0000	0.01	0.0000
TITUS	54.54	3.92	0.37	0.00	4.60	0.22	0.04	0.00	59.14	4.14	0.4078	0.0000	1,747.20	0.01	3.2882	0.0000	4.15	0.0000
UVALDE	67.98		0.40		1.36		0.01		69.35	0.00	0.4077	0.0000	1,503.32	0.01	3.8276	0.0000	0.01	0.0000
FAYETTE	36.01	0.00	0.21	0.00	0.00	0.00	0.00	0.00	36.01	0.00	0.2118	0.0000	758.52	0.00	1.8504	0.0000	0.00	0.0000
CALLAHAN	26.26		0.14		0.00		0.00		26.26	0.00	0.1371	0.0000	833.35	0.00	1.2110	0.0000	0.00	0.0000
HOPKINS	30.02		0.19		0.00		0.00		30.02	0.00	0.1895	0.0000	749.76	0.00	1.4129	0.0000	0.00	0.0000
LAMPASAS	58.39		0.35		0.00		0.00		58.39	0.00	0.3517	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
BLANCO	42.85		0.25		0.00		0.00		42.85	0.00	0.2501	0.0000	810.63	0.00	1.9175	0.0000	0.00	0.0000
FREESTONE	56.23	2.53	0.34	0.02	0.00	0.14	0.00	0.00	56.23	2.67	0.3387	0.0170	1,376.73	0.01	2.6239	0.0000	2.68	0.0170
GRIMES	68.42	0.00	0.40	0.00	0.00	0.00	0.00	0.00	68.42	0.00	0.4024	0.0007	1,441.19	0.01	3.5158	0.0000	0.01	0.0008
LEE	42.24		0.24		0.00		0.00		42.24	0.00	0.2405	0.0000	727.19	0.00	1.9175	0.0000	0.00	0.0000
SOMERVELL	145.80		0.94		0.00		0.00		145.80	0.00	0.9351	0.0000	3,748.73	0.02	7.0644	0.0000	0.02	0.0000
ANDREWS	82.72	0.02	0.39	0.00	0.00	0.00	0.00	0.00	82.72	0.02	0.3939	0.0001	2,696.43	0.01	4.0368	0.0000	0.03	0.0001
BORDEN	33.78		0.15		0.00		0.00		33.78	0.00	0.1514	0.0000	1,724.24	0.01	1.7579	0.0000	0.01	0.0000

Table 49: 2007 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (Using 1999 Base year and 2007 eGRID) (2).

	Electricity Savings and Resultant NOx Reductions (Single Family Houses)				Electricity Savings and Resultant NOx Reductions (Multifamily Houses)				Total Electricity Savings and Resultant NOx Reductions (Single and Multi-Family Houses)				Total Natural Gas Savings and Resultant NOx Reductions (Single and Multi-Family Houses)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
CHEROKEE	35.16	2.41	0.24	0.01	2.20	0.14	0.02	0.00	37.37	2.55	0.2531	0.0158	1,178.66	0.01	2.5002	0.0000	2.55	0.0158
DIMMIT	17.15		0.08		0.00		0.00		17.15	0.00	0.0792	0.0000	267.10	0.00	0.7064	0.0000	0.00	0.0000
FALLS	19.46		0.12		0.72		0.00		20.19	0.00	0.1213	0.0000	505.19	0.00	1.0019	0.0000	0.00	0.0000
COLORADO	16.21		0.10		0.00		0.00		16.21	0.00	0.0953	0.0000	341.34	0.00	0.8327	0.0000	0.00	0.0000
FRIO	36.66	0.23	0.21	0.00	0.00	0.01	0.00	0.00	36.66	0.24	0.2150	0.0022	781.03	0.00	2.0184	0.0000	0.25	0.0023
MILAM	25.13	1.54	0.14	0.01	0.00	0.09	0.00	0.00	25.13	1.63	0.1352	0.0074	426.26	0.00	1.1101	0.0000	1.63	0.0074
JACKSON	30.98		0.19		0.00		0.00		30.98	0.00	0.1894	0.0000	748.03	0.00	1.9429	0.0000	0.00	0.0000
ANDERSON	25.32		0.17		20.94		0.16		46.25	0.00	0.3278	0.0000	1,391.49	0.01	3.4438	0.0000	0.01	0.0000
HILL	60.55		0.36		6.88		0.04		67.44	0.00	0.4032	0.0000	1,754.58	0.01	3.7150	0.0000	0.01	0.0000
CULBERSON	4.37		0.02		0.00		0.00		4.37	0.00	0.0198	0.0000	114.14	0.00	0.2018	0.0000	0.00	0.0000
MASON	27.07		0.16		0.00		0.00		27.07	0.00	0.1580	0.0000	511.98	0.00	1.2110	0.0000	0.00	0.0000
PECOS	12.17	0.03	0.06	0.00	8.14	0.00	0.05	0.00	20.30	0.03	0.1171	0.0002	675.40	0.00	1.7287	0.0000	0.03	0.0002
RAINS	4.29		0.03		0.00		0.00		4.29	0.00	0.0271	0.0000	107.11	0.00	0.2018	0.0000	0.00	0.0000
LAVACA	21.80		0.14		0.00		0.00		21.80	0.00	0.1350	0.0000	592.52	0.00	1.3878	0.0000	0.00	0.0000
PALO PINTO	32.83	0.66	0.17	0.00	0.00	0.04	0.00	0.00	32.83	0.70	0.1713	0.0041	1,041.69	0.00	1.5138	0.0000	0.71	0.0041
KIMBLE	2.03		0.01		0.00		0.00		2.03	0.00	0.0106	0.0000	58.50	0.00	0.1009	0.0000	0.00	0.0000
MADISON	21.61		0.13		0.00		0.00		21.61	0.00	0.1271	0.0000	455.11	0.00	1.1102	0.0000	0.00	0.0000
ARCHER	47.00		0.27		0.00		0.00		47.00	0.00	0.2683	0.0000	1,835.55	0.01	2.1193	0.0000	0.01	0.0000
REFUGIO	10.33		0.06		0.00		0.00		10.33	0.00	0.0631	0.0000	249.34	0.00	0.6476	0.0000	0.00	0.0000
LIMESTONE	6.49	0.29	0.04	0.00	0.00	0.02	0.00	0.00	6.49	0.31	0.0391	0.0000	158.85	0.00	0.3028	0.0000	0.31	0.0000
CLAY	8.95		0.05		0.00		0.00		8.95	0.00	0.0511	0.0000	349.63	0.00	0.4037	0.0000	0.00	0.0000
BEE	23.60		0.14		0.71		0.00		24.31	0.00	0.1486	0.0000	586.10	0.00	1.5271	0.0000	0.00	0.0000
MARTIN	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
GONZALES	14.70		0.09		0.00		0.00		14.70	0.00	0.0863	0.0000	318.05	0.00	0.8074	0.0000	0.00	0.0000
BURLESON	25.21		0.15		0.00		0.00		25.21	0.00	0.1483	0.0000	530.97	0.00	1.2953	0.0000	0.00	0.0000
KARNES	15.03		0.08		0.00		0.00		15.03	0.00	0.0849	0.0000	309.97	0.00	0.8074	0.0000	0.00	0.0000
KLEBERG	79.38		0.38		0.00		0.00		79.38	0.00	0.3819	0.0000	1,363.19	0.01	3.7008	0.0000	0.01	0.0000
BREWSTER	14.20		0.07		0.00		0.00		14.20	0.00	0.0744	0.0000	409.47	0.00	0.7064	0.0000	0.00	0.0000
WINKLER	14.48		0.07		0.00		0.00		14.48	0.00	0.0689	0.0000	471.88	0.00	0.7064	0.0000	0.00	0.0000
FRANKLIN	8.58		0.05		0.00		0.00		8.58	0.00	0.0542	0.0000	214.22	0.00	0.4037	0.0000	0.00	0.0000
YOUNG	24.07	4.29	0.13	0.02	0.00	0.24	0.00	0.00	24.07	4.53	0.1256	0.0248	763.90	0.00	1.1101	0.0000	4.53	0.0248
HOUSTON	9.85		0.07		0.00		0.00		9.85	0.00	0.0662	0.0000	312.71	0.00	0.6476	0.0000	0.00	0.0000
SCURRY	17.78		0.08		0.00		0.00		17.78	0.00	0.0797	0.0000	907.49	0.00	0.9252	0.0000	0.00	0.0000
BOSQUE	17.30	0.12	0.10	0.00	0.00	0.01	0.00	0.00	17.30	0.13	0.1042	0.0012	423.61	0.00	0.8074	0.0000	0.13	0.0012
COMANCHE	2.16		0.01		0.00		0.00		2.16	0.00	0.0130	0.0000	52.95	0.00	0.1009	0.0000	0.00	0.0000
BRISCOE	11.88		0.05		0.00		0.00		11.88	0.00	0.0497	0.0000	967.61	0.00	0.7064	0.0000	0.00	0.0000
CONCHO	2.03		0.01		0.00		0.00		2.03	0.00	0.0106	0.0000	58.50	0.00	0.1009	0.0000	0.00	0.0000
ZAVALA	7.35		0.03		0.00		0.00		7.35	0.00	0.0340	0.0000	114.47	0.00	0.3028	0.0000	0.00	0.0000
NOLAN	2.19	0.39	0.01	0.00	0.00	0.02	0.00	0.00	2.19	0.41	0.0114	0.0027	69.45	0.00	0.1009	0.0000	0.41	0.0027
BROOKS	6.06		0.03		0.00		0.00		6.06	0.00	0.0290	0.0000	101.22	0.00	0.2776	0.0000	0.00	0.0000
ROBERTSON	41.41	0.53	0.24	0.00	0.00	0.03	0.00	0.00	41.41	0.56	0.2436	0.0017	872.30	0.00	2.1280	0.0000	0.57	0.0017
LIVE OAK	31.42		0.15		0.00		0.00		31.42	0.00	0.1537	0.0000	568.67	0.00	1.4803	0.0000	0.00	0.0000
HAMILTON	4.33		0.03		0.00		0.00		4.33	0.00	0.0261	0.0000	105.90	0.00	0.2018	0.0000	0.00	0.0000
JONES	0.00	0.80	0.00	0.00	3.38	0.04	0.02	0.00	3.38	0.83	0.0151	0.0044	115.29	0.00	0.3744	0.0000	0.83	0.0044
REAGAN	6.00		0.03		0.00		0.00		6.00	0.00	0.0293	0.0000	168.17	0.00	0.3028	0.0000	0.00	0.0000
WARD	12.41	12.76	0.06	0.08	0.00	0.72	0.00	0.01	12.41	13.49	0.0591	0.0892	404.46	0.00	0.6055	0.0000	13.49	0.0892
RED RIVER	5.11	0.00	0.03	0.00	0.00	0.00	0.00	0.00	5.11	0.00	0.0349	0.0000	153.79	0.00	0.2776	0.0000	0.00	0.0000
HASKELL	4.38	0.00	0.02	0.00	0.85	0.00	0.00	0.00	5.22	0.00	0.0266	0.0000	167.71	0.00	0.2954	0.0000	0.00	0.0000
HOWARD	4.14	0.38	0.02	0.00	0.00	0.02	0.00	0.00	4.14	0.40	0.0197	0.0026	134.82	0.00	0.2018	0.0000	0.40	0.0026
SAN SABA	6.77		0.04		0.00		0.00		6.77	0.00	0.0395	0.0000	127.99	0.00	0.3028	0.0000	0.00	0.0000
JACK	8.75	1.46	0.05	0.01	0.00	0.08	0.00	0.00	8.75	1.54	0.0457	0.0098	277.78	0.00	0.4037	0.0000	1.54	0.0098
STEPHENS	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
RUNNELS	4.06		0.02		0.00		0.00		4.06	0.00	0.0213	0.0000	116.99	0.00	0.2018	0.0000	0.00	0.0000
REEVES	4.14		0.02		0.00		0.00		4.14	0.00	0.0197	0.0000	134.82	0.00	0.2018	0.0000	0.00	0.0000
DE WITT	8.85		0.05		0.00		0.00		8.85	0.00	0.0541	0.0000	213.72	0.00	0.5551	0.0000	0.00	0.0000
CHILDRESS	5.33		0.02		0.00		0.00		5.33	0.00	0.0239	0.0000	272.25	0.00	0.2776	0.0000	0.00	0.0000
CROSBY	24.89		0.11		0.00		0.00		24.89	0.00	0.1115	0.0000	1,270.49	0.01	1.2953	0.0000	0.01	0.0000
DAWSON	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
MITCHELL	0.00	10.28	0.00	0.07	0.00	0.58	0.00	0.00	0.00	10.86	0.0000	0.0764	0.00	0.00	0.0000	0.0000	10.86	0.0764
WILBARGER	8.95	0.56	0.05	0.00	0.00	0.03	0.00	0.00	8.95	0.59	0.0511	0.0000	349.63	0.00	0.4037	0.0000	0.59	0.0000
COLEMAN	4.22	0.03	0.02	0.00	0.00	0.00	0.00	0.00	4.22	0.03	0.0224	0.0001	119.53	0.00	0.2018	0.0000	0.03	0.0001
UPTON	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.0000	0.0001	0.00	0.00	0.0000	0.0000	0.02	0.0001
COKE	2.10	0.00	0.01	0.00	0.00	0.00	0.00	0.00	2.10	0.00	0.0108	0.0000	69.84	0.00	0.1009	0.0000	0.00	0.0000
CROCKETT	38.54	0.00	0.20	0.00	0.00	0.00	0.00	0.00	38.54	0.00	0.2021	0.0000	1,111.42	0.01	1.9175	0.0000	0.01	0.0000
HARDEMAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
BANDERA	3.76		0.02		0.00		0.00		3.76	0.00	0.0223	0.0000	92.71	0.00	0.2018	0.0000	0.00	0.0000
BAYLOR	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
COTTLE	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
CRANE	38.02		0.19		0.00		0.00		38.02	0.00	0.1856	0.0000	1,065.07	0.00	1.9175	0.0000	0.00	0.0000
DELTA	23.59		0.15		0.00		0.00		23.59	0.00	0.1489	0.0000	589.10	0.00	1.1101	0.0000	0.00	0.0000
DICKENS	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
DUVAL	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
EASTLAND	2.19		0.01		0.00		0.00		2.19	0.00	0.0114	0.0000	69.45	0.00	0.1009	0.0000	0.00	0.0000
EDWARDS	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
FISHER	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
FOARD	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
GLASSCOCK	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
GOLIAD	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
HALL	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
HUDSPETH	277.56		1.26		2.44		0.01		280.00	0.00	1.2663	0.0000	7,327.98	0.03	13.0508	0.0001	0.03	0.0001
IRION	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
JEFF DAVIS	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
KENEDY	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
KENT	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
KING	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
KINNEY	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
KNOX	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
LA SALLE	95.52		0.44		4.65		0.02		100.17	0.00	0.4644	0.0000	1,571.00	0.01	4.1699	0.0000	0.01	0.0000
LEON	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
LOVING	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
MENARD	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
MILLS	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
MONTAGUE	2.13		0.01		0.00		0.00		2.13	0.00	0.0135	0.0000	53.94	0.00	0.1009	0.0000	0.00	0.0000
MOTLEY	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
REAL	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
SCHLEICHER	4.06		0.02		0.00		0.00		4.06	0.00	0.0213	0.0000	116.99	0.00	0.2018	0.0000	0.00	0.0000
SHACKELFORD	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
STARR	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
STERLING	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
STONEWALL	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
SUTTON	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
TERRELL	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
THROCKMORTON	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
ZAPATA	0.00		0.00		0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.00	0.0000	0.0000	0.00	0.0000
TOTAL	**325,483.35**	**217.18**	**1,929.06**	**1.27**	**20,040.57**	**13.39**	**124.15**	**0.08**	**345,523.93**	**230.57**	**2,053.21**	**1.35**	**7,576,388.40**	**34.85**	**16,949.93**	**0.08**	**265.42**	**1.43**



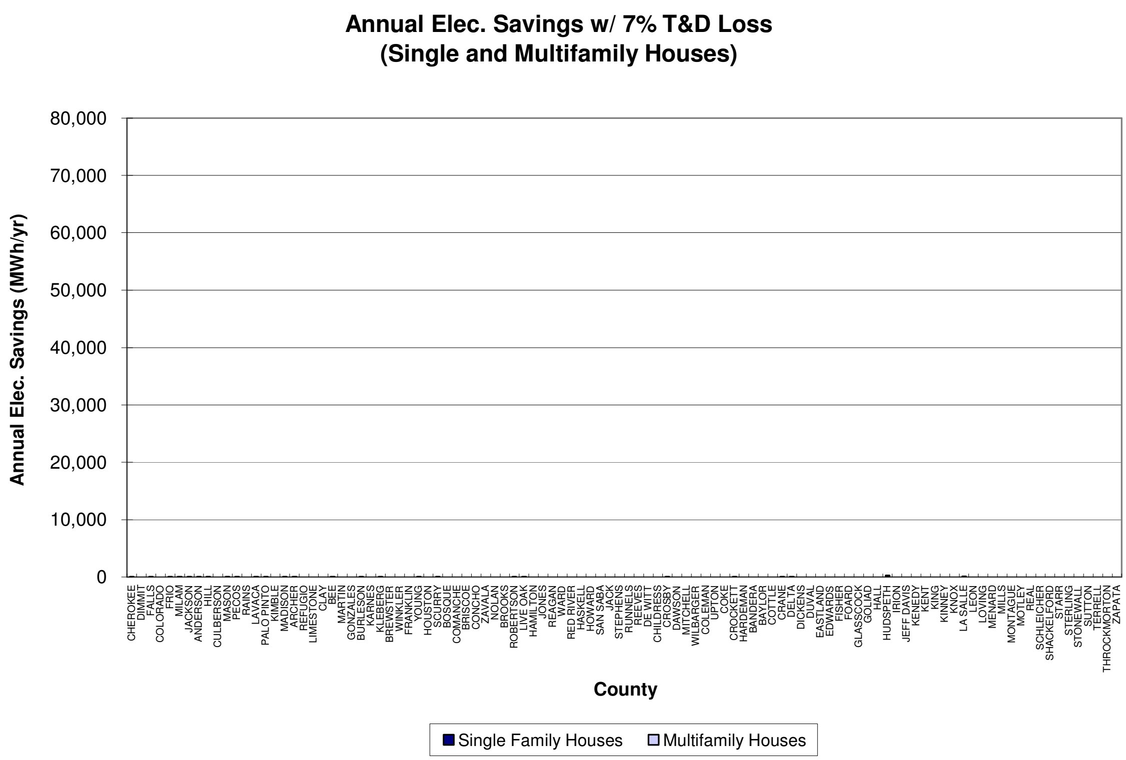
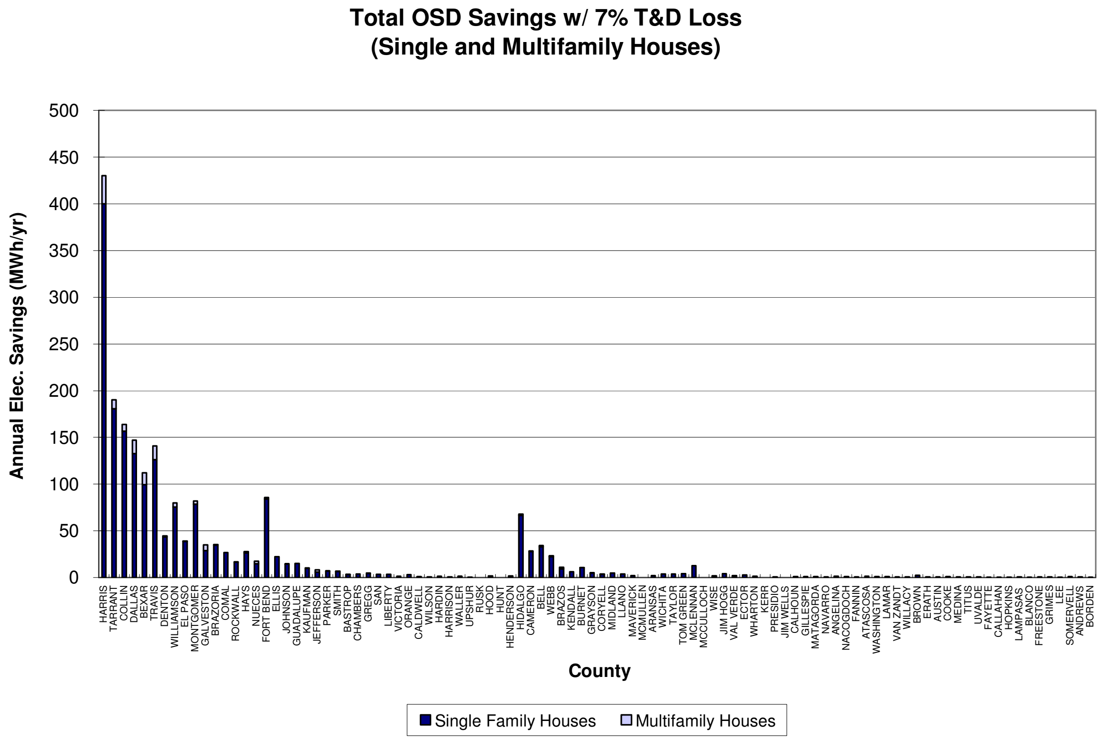


Figure 93: 2007 Annual Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences by County.



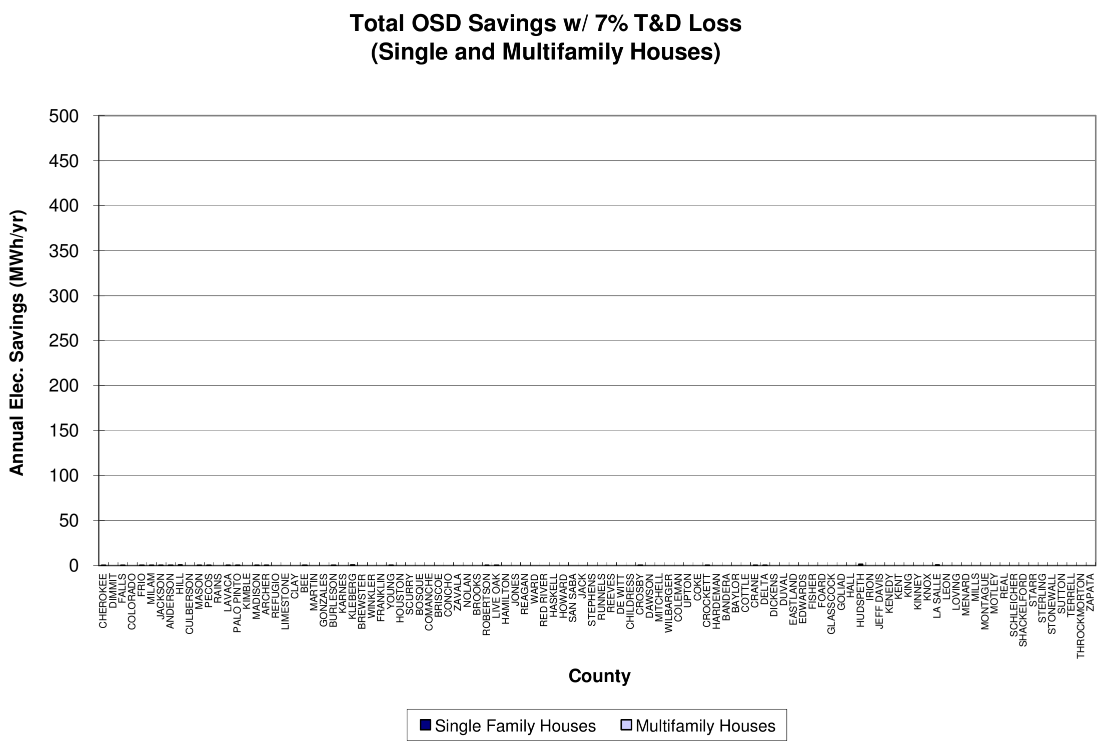
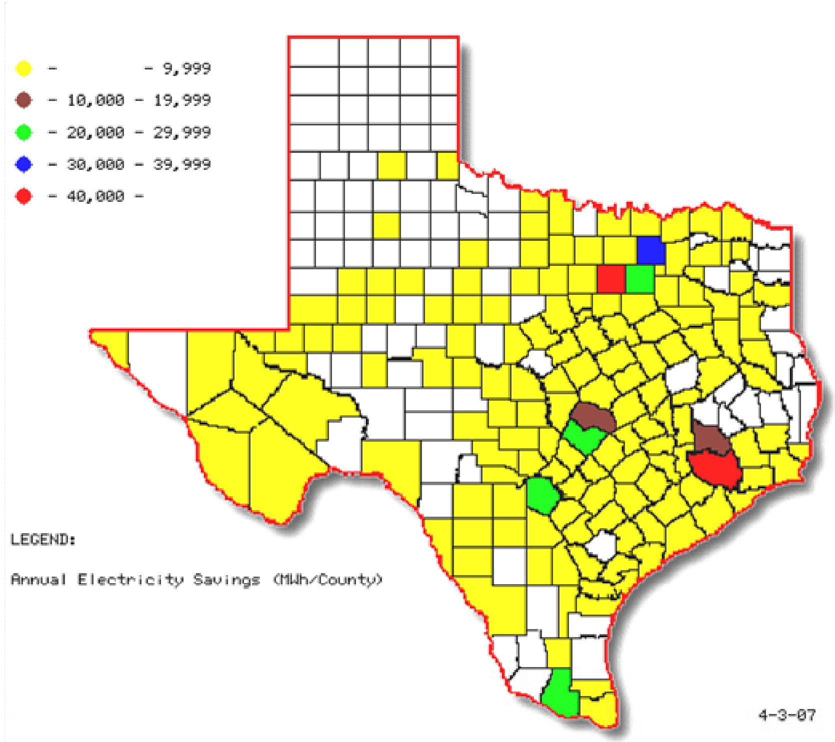


Figure 94: 2007 Annual Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences by County.



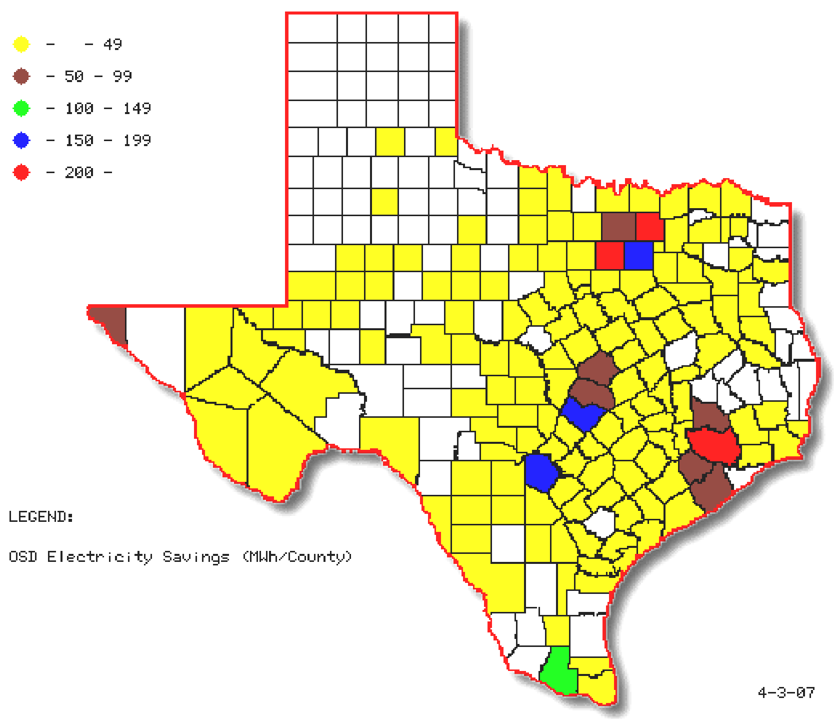
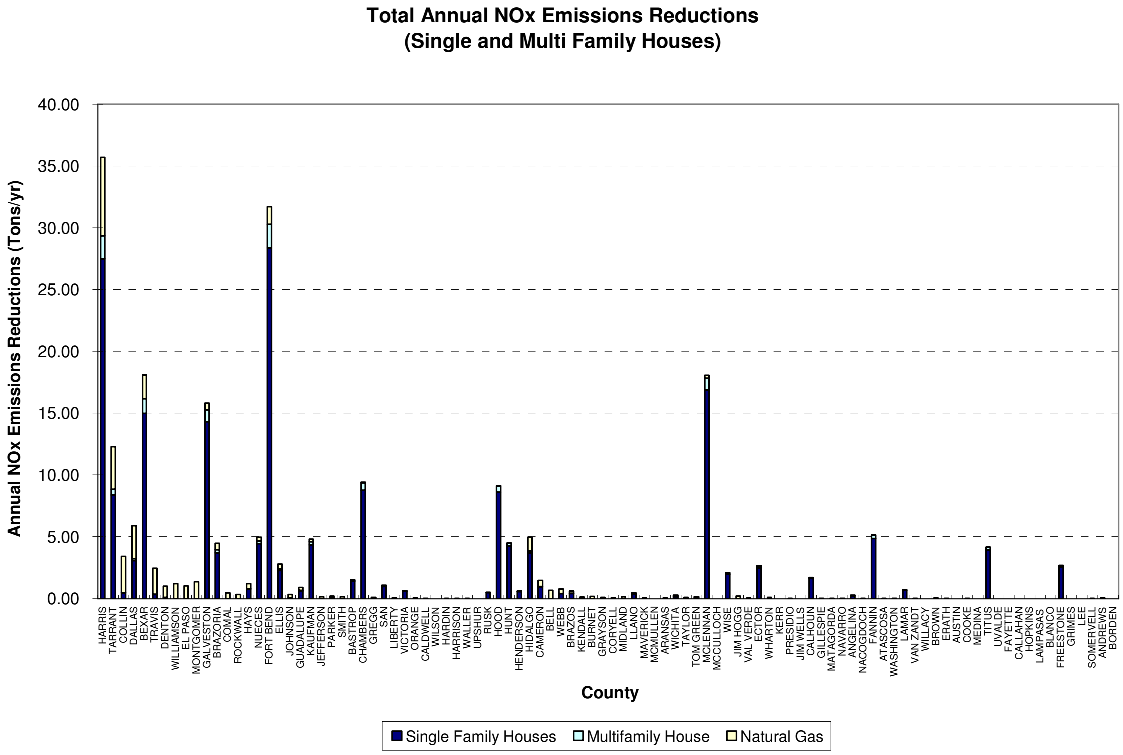


Figure 95: 2006 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences by County.



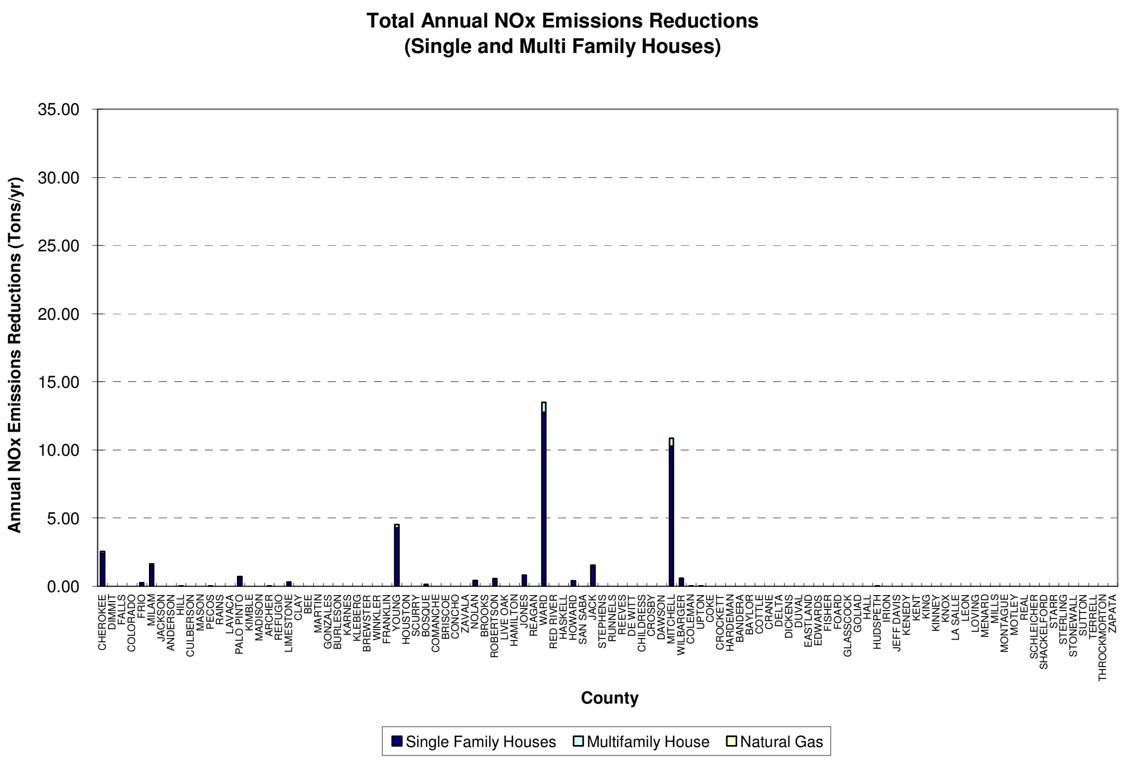
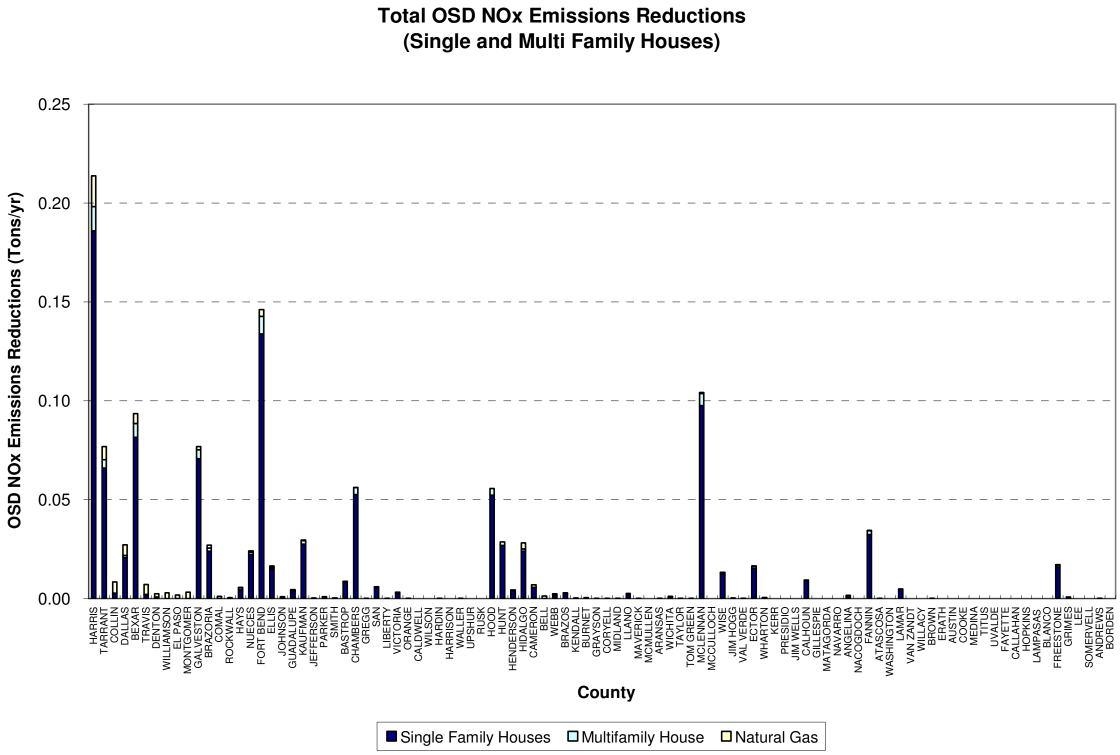


Figure 96: 2007 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 Base Year and 2007 eGRID).



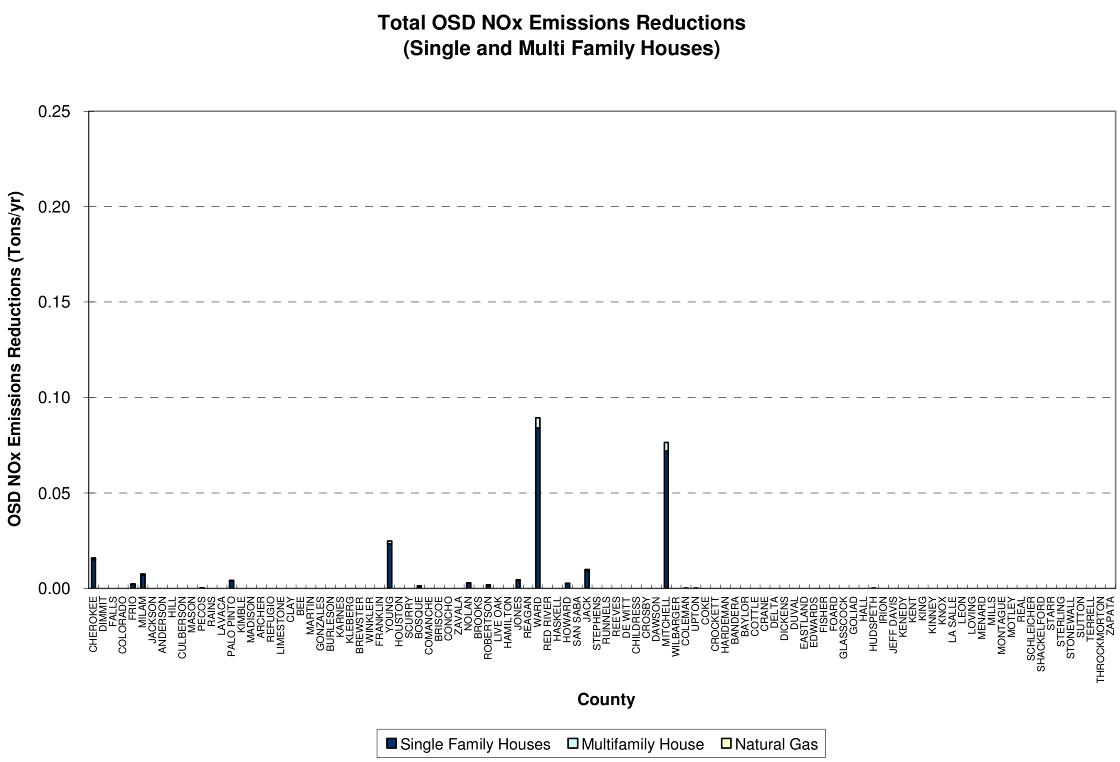
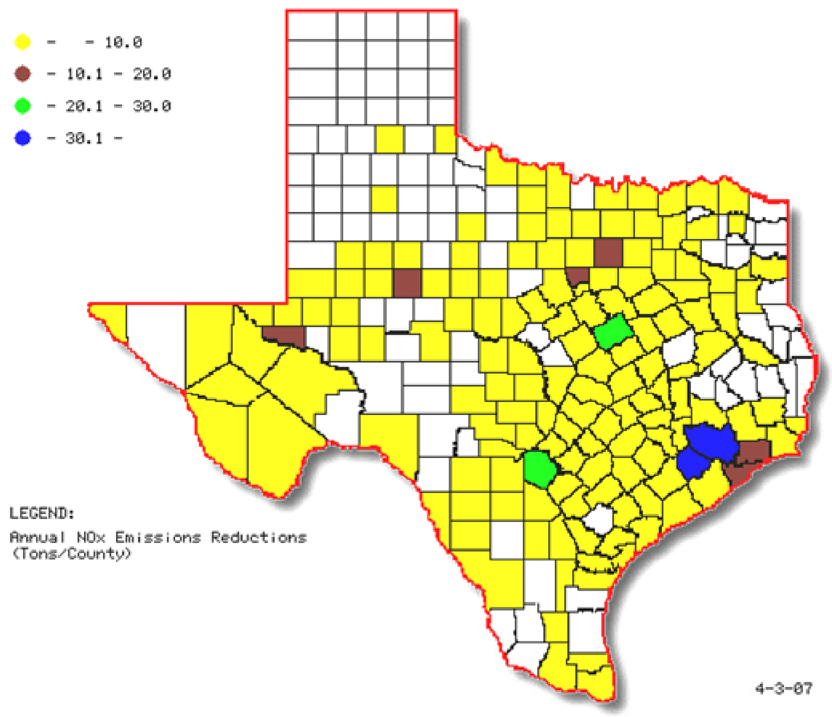


Figure 97: 2007 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (using 1999 Base Year and 2007 eGRID).



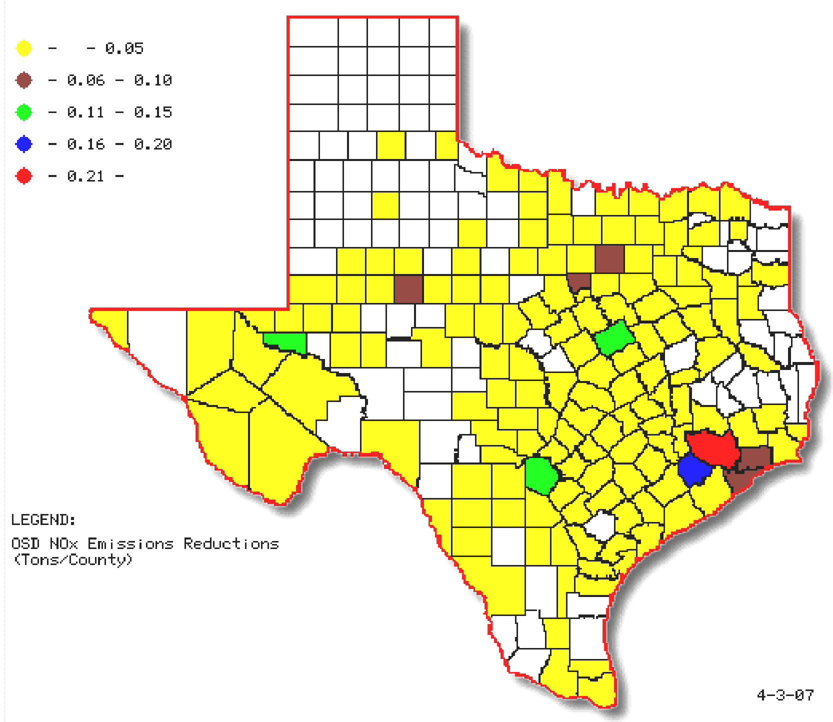


Figure 98: 2007 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences by County (Using 1999 Base year and 2007 eGRID).

6.1.4 2007 Results for Commercial Construction.

This section reports on the calculated energy and emissions savings from new commercial construction in 2007 that was built to meet the new ASHRAE Standard 90.1-1999 energy code. Construction prior to September 2001 was assumed to comply to ASHRAE Standard 90.1-1989, which was determined from a survey of engineers and architects reported in the Laboratory's 2006 Annual report to the TCEQ. To determine the energy and emissions savings from new commercial construction in all counties in ERCOT region as well as the 41 non-attainment and affected counties, data from two sources were merged into one analysis as shown in Figure 99. In this figure, the analysis is described that covers results shown in Figure 100 to Figure 105 and in Table 50 to Table 75.

Beginning in the upper left of Figure 99, the Dodge database of the square footage of new commercial construction in Texas (Dodge 2005) was merged with the energy savings calculations published by the Pacific Northwest National Laboratory (PNNL) in a report prepared for the U.S.D.O.E. (USDOE 2004). This allowed for the new construction to be tracked by county, and energy savings to be calculated by building type. In the next block in Figure 99 and Table 50, the merged categories from the Dodge and PNNL database can be seen. This resulted in 12 Dodge categories being merged into 7 PNNL energy use categories. In the 4th and 5th PNNL category, the Dodge "stores and restaurant" category had to be split into two categories to match the two PNNL categories for "retail" and "food." To accomplish this, information published in the 1999 and 2003 CBEC database (Table 51) by the U.S.D.O.E's Energy Information Agency (EIA) was used to determine the percentages used to split the Dodge conditioned area for each county as shown (i.e., 21.06% for food and 78.94% for retail). Table 52 shows the Dodge data for 1999 to 2003 prior to merging into the PNNL categories, which are shown by category in Figure 100 and Figure 101. Table 54 shows the Dodge data for 1999 to 2003 after merging into the required PNNL categories for the energy savings calculations, which were then used with the Dodge data from Table 54 for 2003 in the 2007 calculations. The square footage of all PNNL building types are shown for each county, followed by individual graphs of each building type in the lower seven graphs.

In the next step the PNNL energy savings, which represent buildings built to ASHRAE Standard 90.1-1989 versus Standard 90.1-1999, which are expressed per square foot, were then multiplied by the published square feet of new construction. For the 2007 results, the values for 2005 were assumed[32] for 2007
, and Table 60 show the annual and OSD energy use calculated for new construction, by building type, for Standard 90.1-1989, and 90.1-1999. Table 66 shows the county-wide annual electricity and natural gas savings by building type[33] [34].

In order to calculate the Ozone Season Day electricity and natural gas savings, simulations were performed on a typical office building that simulated a 6-story, 90,000-sq. ft. office building in Central Texas. Figure 104 provides an image of the office building (3-story shown). Table 74 (building LOADS) and Table 75 (building SYSTEM and PLANT information) provide the input characteristics used to simulate the office building. The results of these simulations show about a 13% annual energy use reduction (Haberl et al. 2005). The simulations were also used to simulate the electricity and natural gas used during the Ozone Season Day (July 15 to Sept. 15) as shown in Figure 106, Figure 107, and Table 76. In the bottom row of Table 76, a ratio was calculated to allow for the conversion of annual savings to OSD savings. This ratio was then used in the remaining building types to accomplish this conversion.

In the next calculation step, electric utility providers were assigned to each county according to the published 1998 sales data from the Texas Public Utilities Commission as shown in Table 77. In the case where more than one utility was shown selling electricity in a county, a percentage of electricity use was allocated according to the PUCT's 1998 sales data. In the lower half of Table 77, the total electricity savings by utility provider is shown for 2005 for all estimated new commercial construction. Table 78 shows the calculated annual NOx emissions reductions from electricity using the 1999 eGRID table for Texas.

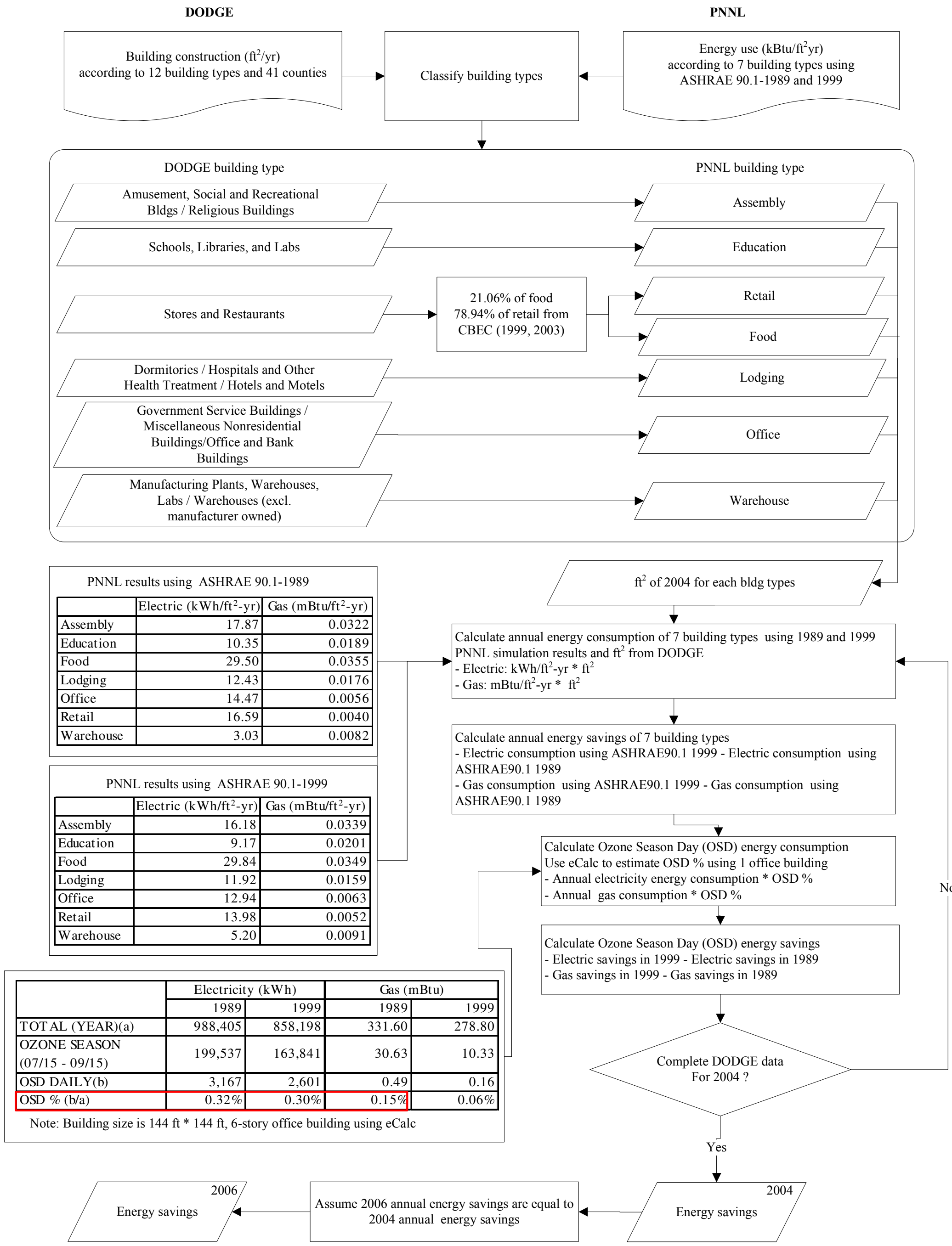
In a similar fashion as the annual calculations, electric utility providers were assigned to each county to calculate the OSD electricity savings by utility, as shown in Table 79. Table 80 shows the calculated NOx emissions reductions from electricity savings using the 1999 eGRID table for Texas. Table 81 shows the data transformation required to present the data in the bar charts that follow.

Table 82 shows the transformation of the annual and OSD county-wide electricity and natural gas savings, along with the associated 1999 NOx emissions reductions with 7% T&D losses. Figure 108 shows the data transformed which uses the 1999 eGRID and 7% T&D losses. In Figure 110 and Figure 111 the NOx emissions reductions from the electricity use savings are shown using the 2007 eGRID for Texas.

6.1.5 2007 Results for New Commercial Construction using 2007 eGRID.

[32] This assumption is based on conversations with Texas State demographer's office.
[33] In this table (-) values are savings, (+) values are increased energy use.
[34] In a similar fashion as the preceeding table, in this table (-) values are savings, (+) values are increased energy use.

Using the 2007 eGRID, the total NOx reductions from electricity and natural gas savings from new commercial construction in 2007 are calculated to be 56.67 tons NOx/year which represents 60.52 tons NOx/year from electricity savings and -3.85 tons NOx/year (i.e., an increase) from natural gas savings. On a peak Ozone Season Day (OSD), the NOx reductions in 2007 are calculated to be 0.45 tons of NOx/day which represents 0.38 tons NOx/day from electricity savings and 0.07 tons NOx/day from natural gas savings.



PNNL results using ASHRAE 90.1-1989

	Electric (kWh/ft²-yr)	Gas (mBtu/ft²-yr)
Assembly	17.87	0.0322
Education	10.35	0.0189
Food	29.50	0.0355
Lodging	12.43	0.0176
Office	14.47	0.0056
Retail	16.59	0.0040
Warehouse	3.03	0.0082

PNNL results using ASHRAE 90.1-1999

	Electric (kWh/ft²-yr)	Gas (mBtu/ft²-yr)
Assembly	16.18	0.0339
Education	9.17	0.0201
Food	29.84	0.0349
Lodging	11.92	0.0159
Office	12.94	0.0063
Retail	13.98	0.0052
Warehouse	5.20	0.0091

	Electricity (kWh)		Gas (mBtu)	
	1989	1999	1989	1999
TOTAL (YEAR)(a)	988,405	858,198	331.60	278.80
OZONE SEASON (07/15 - 09/15)	199,537	163,841	30.63	10.33
OSD DAILY(b)	3,167	2,601	0.49	0.16
OSD % (b/a)	0.32%	0.30%	0.15%	0.06%

Note: Building size is 144 ft * 144 ft, 6-story office building using eCalc

Figure 99: Analysis Method for Calculating the 2007 Energy and Emissions Savings from Commercial Buildings (Updated)

Table 50: Commercial Building Descriptions from USDOE (2004) Report and Dodge (2005).

No	PNNL Bldg Types	Dodge Bldg Types
1	Assembly	Amusement, Social and Recreational Bldgs
2		Religious Buildings
3	Education	Schools, Libraries, and Labs (nonmfg)
4	Retail	Stores and Restaurants
5	Food	Stores and Restaurants
6	Lodging	Dormitories
7		Hospitals and Other Health Treatment
8		Hotels and Motels
9	Office	Government Service Buildings
10		Miscellaneous Nonresidential Buildings
11		Office and Bank Buildings
12	Warehouse	Manufacturing Plants, Warehouses, Labs
13		Warehouses (excl. manufacturer owned)

Table 51: Floor Area from CBEC (1999, 2003) Database for Retail and Food Type Commercial Buildings.

		CBEC (1999)		CBEC (2003)	
		All (million square feet)	South (million square feet)	All (million square feet)	South (million square feet)
Food	Food Sales	994	392	1,255	487
	Food Service	1851	676	1,654	764
Retail	Retail (Other Than Mall)	4766	1566	4,317	1,844
	Enclosed and Strip Malls	5631	2513	6,875	3,251

	South		All	
	Food %	Retail %	Food %	Retail %
CBEC (1999)[1]	20.75	79.25	21.48	78.52
CBEC (2003)[2]	19.71	80.29	20.63	79.37
Average	20.23	79.77	21.06	78.94

Note1: http://www.eia.doe.gov/emeu/cbecs/pdf/alltables.pdf, page 4.
Note2: http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/pdf2003/seta.pdf, Page 1.

Table 52: New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2007). Table shows Dodge (2005) data before merging into PNNL building types (sq. ft. x 1000) (Part 1).

County	Assembly	Education	Retail	Food	Lodging	Office	Warehouse
HARRIS	2304	4772	3819	1019	2657	3870	7754
TARRANT	1077	2284	2435	650	1465	1317	2740
COLLIN	767	1625	1887	503	812	1139	817
DALLAS	1585	3083	2236	597	1508	3522	5073
BEXAR	833	2786	1786	476	1880	1386	1414
TRAVIS	534	890	1096	292	1107	894	675
DENTON	414	1318	786	210	484	398	959
WILLIAMSON	189	649	496	132	200	219	193
EL PASO	324	822	378	101	330	508	1228
MONTGOMERY	249	675	578	154	277	454	290
GALVESTON	143	336	295	79	181	296	105
BRAZORIA	128	500	324	87	78	95	158
COMAL	38	220	108	29	71	78	42
ROCKWALL	34	203	123	33	20	34	47
HAYS	85	248	137	36	67	155	73
NUECES	149	221	103	27	237	178	181
FORT BEND	261	676	563	150	226	429	599
ELLIS	86	219	118	31	40	48	561
JOHNSON	16	220	84	22	7	13	105
GUADALUPE	27	181	89	24	48	84	183
KAUFMAN	43	262	63	17	12	32	174
JEFFERSON	112	150	210	56	313	131	61
PARKER	13	182	99	26	52	12	9
SMITH	114	163	125	33	173	174	210
BASTROP	16	150	46	12	128	17	18
CHAMBERS	10	48	7	2	0	19	0
GREGG	81	56	75	20	135	43	71
SAN PATRICIO	20	83	34	9	28	111	355
LIBERTY	5	178	14	4	6	16	2
VICTORIA	30	28	51	14	35	30	17
ORANGE	9	88	14	4	16	15	12
CALDWELL	1	36	7	2	3	1	7
WILSON	5	54	10	3	22	1	0
HARDIN	9	55	19	5	0	2	0
HARRISON	20	31	16	4	17	6	5
WALLER	27	101	4	1	0	3	117
UPSHUR	16	43	6	2	3	8	3
RUSK	1	12	21	6	2	5	5
HOOD	35	64	13	3	6	11	0
HUNT	31	151	26	7	25	33	20
HENDERSON	10	49	21	6	5	6	40
HIDALGO	0	0	0	0	0	0	0
CAMERON	127	621	268	72	342	271	475
BELL	110	365	125	33	462	230	167
WEBB	52	517	101	27	179	148	222
BRAZOS	163	319	115	31	228	205	59
KENDALL	0	0	0	0	0	0	0
BURNET	10	77	15	4	14	18	4
GRAYSON	37	162	62	17	50	24	130
CORYELL	13	35	19	5	17	4	7
MIDLAND	94	62	95	25	54	63	19
LLANO	0	20	0	0	47	4	0
MAVERICK	17	54	15	4	37	32	1
MCMULLEN	2	1	0	0	0	1	0
ARANSAS	5	2	35	9	9	19	0
WICHITA	88	75	75	20	247	84	42
TAYLOR	51	74	120	32	90	48	78
TOM GREEN	84	122	71	19	154	55	45
MCLENNAN	105	393	147	39	180	136	179
MCCULLOCH	1	13	0	0	0	0	0
WISE	28	110	1	0	71	29	0
JIM HOGG	0	8	0	0	1	10	0
VAL VERDE	18	61	15	4	18	56	7
ECTOR	24	78	32	9	106	18	185
WHARTON	13	23	42	11	9	9	16
KERR	43	50	23	6	53	26	0
PRESIDIO	5	9	0	0	0	3	1
JIM WELLS	0	49	22	6	23	7	4
CALHOUN	0	11	17	5	1	20	0
GILLESPIE	11	8	19	5	10	4	8
MATAGORDA	5	32	6	2	11	8	8
NAVARRO	7	70	42	11	32	4	80
ANGELINA	56	89	76	20	49	35	11
NACOGDOCHES	30	165	27	7	38	19	19
FANNIN	10	35	5	1	7	4	8
ATASCOSA	20	36	20	5	15	4	4
WASHINGTON	26	31	28	8	10	11	21
LAMAR	7	52	9	2	4	9	3
VAN ZANDT	3	84	0	0	0	2	1
WILLACY	2	37	23	6	1	23	6
BROWN	9	23	12	3	19	16	10
ERATH	7	49	4	1	12	3	3
AUSTIN	1	57	1	0	7	1	291
COOKE	10	36	24	6	32	8	9
MEDINA	8	50	2	1	0	27	2
TITUS	16	97	26	7	0	8	0
UVALDE	12	27	28	7	4	6	7
FAYETTE	3	22	4	1	24	7	1
CALLAHAN	3	18	0	0	0	3	1
HOPKINS	8	25	15	4	8	3	18
LAMPASAS	2	10	12	3	7	4	0
BLANCO	0	23	0	0	0	0	0
FREESTONE	0	30	0	0	1	5	0
GRIMES	5	12	0	0	0	6	0
LEE	1	17	1	0	0	6	1
SOMERVELL	0	9	0	0	1	6	1
ANDREWS	2	15	0	0	8	0	0
BORDEN	0	0	0	0	0	0	0
CHEROKEE	19	30	5	1	14	11	18
DIMMIT	0	7	0	0	0	16	0

Table 53: New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2007). Table shows Dodge (2005) data before merging into PNNL building types (sq. ft. x 1000) (Part 2).

County	Assembly	Education	Retail	Food	Lodging	Office	Warehouse
FALLS	3	13	0	0	0	6	0
COLORADO	0	30	0	0	7	14	0
FRIO	1	29	7	2	4	1	0
MILAM	3	39	10	3	0	19	0
JACKSON	2	22	1	0	0	1	0
ANDERSON	12	9	19	5	15	16	11
HILL	6	74	10	3	4	1	0
CULBERSON	0	4	0	0	0	1	0
MASON	0	3	0	0	0	5	0
PECOS	5	9	0	0	14	16	0
RAINS	2	21	0	0	0	3	0
LAVACA	15	4	0	0	2	4	0
PALO PINTO	6	37	21	6	4	4	2
KIMBLE	2	0	0	0	0	2	0
MADISON	1	19	0	0	0	1	0
ARCHER	1	11	0	0	3	0	1
REFUGIO	2	1	0	0	0	3	0
LIMESTONE	4	7	12	3	4	11	1
CLAY	1	5	0	0	0	8	0
BEE	13	33	4	1	14	13	0
MARTIN	0	0	0	0	0	0	0
GONZALES	1	12	3	1	5	3	0
BURLESON	1	13	1	0	3	9	0
KARNES	0	10	0	0	2	7	0
KLEBERG	7	48	41	11	10	7	1
BREWSTER	5	11	0	0	6	10	6
WINKLER	1	0	0	0	0	0	0
FRANKLIN	2	0	0	0	1	1	106
YOUNG	7	14	16	4	4	3	1
HOUSTON	3	8	26	7	10	3	0
SCURRY	0	0	2	1	1	1	6
BOSQUE	1	16	0	0	0	1	0
COMANCHE	2	9	0	0	18	0	0
BRISCOE	0	0	0	0	0	0	0
CONCHO	0	0	0	0	0	2	0
ZAVALA	0	16	0	0	4	4	1
NOLAN	6	17	10	3	8	0	0
BROOKS	0	0	0	0	0	9	0
ROBERTSON	2	4	0	0	2	0	2
LIVE OAK	3	0	0	0	0	0	0
HAMILTON	1	12	0	0	7	0	0
JONES	8	8	0	0	0	0	4
REAGAN	1	0	0	0	0	5	0
WARD	0	0	0	0	0	53	1
RED RIVER	3	27	0	0	0	1	0
HASKELL	0	0	9	2	0	14	0
HOWARD	7	16	2	0	8	4	0
SAN SABA	4	3	1	0	0	0	0
JACK	1	1	0	0	0	17	0
STEPHENS	0	6	0	0	1	0	0
RUNNELS	0	6	1	0	0	2	0
REEVES	5	2	0	0	4	47	0
DE WITT	0	0	0	0	0	0	0
CHILDRESS	5	3	0	0	2	2	5
CROSBY	2	1	0	0	2	0	0
DAWSON	0	7	0	0	0	16	0
MITCHELL	4	0	0	0	5	14	0
WILBARGER	3	7	9	2	11	17	1
COLEMAN	2	3	0	0	1	2	0
UPTON	0	0	0	0	1	0	0
COKE	3	3	0	0	0	0	1
CROCKETT	3	2	0	0	0	0	0
HARDEMAN	0	0	0	0	0	0	0
BANDERA	2	40	0	0	4	5	0
BAYLOR	0	1	0	0	2	0	0
COTTLE	0	2	0	0	0	0	0
CRANE	1	1	0	0	0	0	0
DELTA	1	9	0	0	0	0	0
DICKENS	0	0	0	0	0	0	0
DUVAL	0	20	1	0	0	4	0
EASTLAND	7	4	20	5	1	4	0
EDWARDS	0	0	0	0	0	0	0
FISHER	0	3	0	0	2	0	0
FOARD	0	0	0	0	0	0	0
GLASSCOCK	0	0	0	0	0	0	0
GOLIAD	0	4	0	0	0	1	0
HALL	0	1	0	0	0	0	0
HUDSPETH	1	9	0	0	0	13	0
IRION	0	0	0	0	0	0	0
JEFF DAVIS	6	0	0	0	0	2	0
KENEDY	0	0	0	0	0	1	0
KENT	0	0	0	0	2	0	0
KING	0	0	0	0	0	0	0
KINNEY	0	3	0	0	0	23	0
KNOX	1	1	0	0	0	0	0
LA SALLE	0	2	1	0	2	1	0
LEON	7	7	0	0	0	0	0
LOVING	0	0	0	0	0	0	0
MENARD	0	1	0	0	0	0	0
MILLS	2	8	0	0	0	1	0
MONTAGUE	1	13	10	3	6	5	1
MOTLEY	0	1	0	0	0	0	0
REAL	0	1	0	0	4	1	0
SCHLEICHER	0	0	0	0	0	0	0
SHACKELFORD	2	4	0	0	2	0	0
STARR	9	172	3	1	6	9	0
STERLING	0	0	0	0	0	0	0
STONEWALL	0	0	0	0	0	0	0
SUTTON	0	7	0	0	5	3	0
TERRELL	0	0	0	0	0	10	0
THROCKMORTON	1	0	0	0	0	1	0
ZAPATA	2	40	1	0	1	12	0
TOTAL	**11436**	**29427**	**20371**	**5435**	**15606**	**18047**	**26644**

Table 54: New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2007). Table shows Dodge (2005) data merged into PNNL building types (sq. ft. x 1000) (Part 1)

(square feet in thousands)								
Non-attainment Counties	**Assembly**	**Education**	**Retail**	**Food**	**Lodging**	**Office**	**Warehouse**	**Stores and Restaurants**
BRAZORIA	128	500	324	87	78	95	158	514
CHAMBERS	10	48	7	2	0	19	0	0
COLLIN	767	1,625	1,887	503	812	1,139	817	1,580
DALLAS	1,585	3,083	2,236	597	1,508	3,522	5,073	2,004
DENTON	414	1,318	786	210	484	398	959	907
EL PASO	324	822	378	101	330	508	1,228	537
FORT BEND	261	676	563	150	226	429	599	370
GALVESTON	143	336	295	79	181	296	105	426
HARDIN	9	55	19	5	0	2	0	0
HARRIS	2,304	4,772	3,819	1,019	2,657	3,870	7,754	4,778
JEFFERSON	112	150	210	56	313	131	61	195
LIBERTY	5	178	14	4	6	16	2	9
MONTGOMERY	249	675	578	154	277	454	290	452
ORANGE	9	88	14	4	16	15	12	104
TARRANT	1,077	2,284	2,435	650	1,465	1,317	2,740	2,836
WALLER	27	101	4	1	0	3	117	22
TOTAL (NON-ATTAINMENT)	7,424	16,711	13,570	3,620	8,352	12,214	19,914	14,734

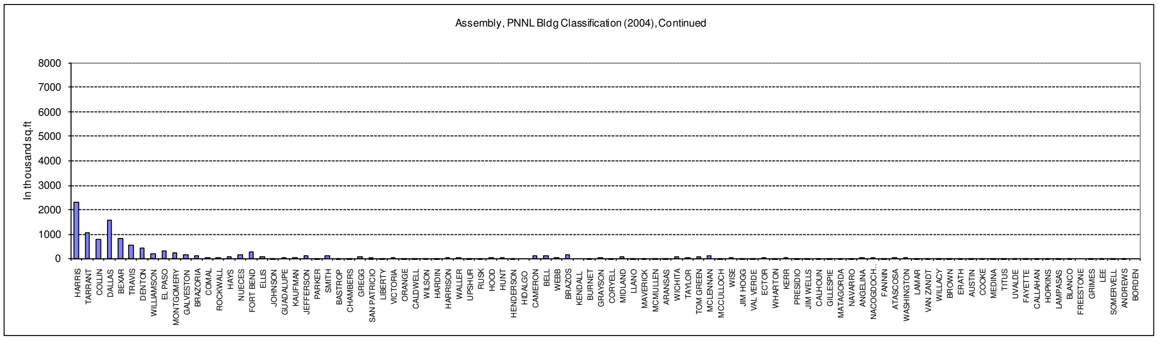
Affected Counties	**Assembly**	**Education**	**Retail**	**Food**	**Lodging**	**Office**	**Warehouse**	**Stores and Restaurants**
BASTROP	16	150	46	12	128	17	18	29
BEXAR	833	2,786	1,786	476	1,880	1,386	1,414	1,735
CALDWELL	1	36	7	2	3	1	7	4
COMAL	38	220	108	29	71	78	42	152
ELLIS	86	219	118	31	40	48	561	87
GREGG	81	56	75	20	135	43	71	13
GUADALUPE	27	181	89	24	48	84	183	387
HARRISON	20	31	16	4	17	6	5	4
HAYS	85	248	137	36	67	155	73	405
HENDERSON	10	49	21	6	5	6	40	2
HOOD	35	64	13	3	6	11	0	0
HUNT	31	151	26	7	25	33	20	15
JOHNSON	16	220	84	22	7	13	105	193
KAUFMAN	43	262	63	17	12	32	174	194
NUECES	149	221	103	27	237	178	181	103
PARKER	13	182	99	26	52	12	9	532
ROCKWALL	34	203	123	33	20	34	47	152
RUSK	1	12	21	6	2	5	5	140
SAN PATRICIO	20	83	34	9	28	111	355	161
SMITH	114	163	125	33	173	174	210	64
TRAVIS	534	890	1,096	292	1,107	894	675	1,436
UPSHUR	16	43	6	2	3	8	3	0
VICTORIA	30	28	51	14	35	30	17	15
WILLIAMSON	189	649	496	132	200	219	193	946
WILSON	5	54	10	3	22	1	0	74
TOTAL (AFFECTED)	2,426	7,201	4,752	1,268	4,322	3,577	4,410	6,843

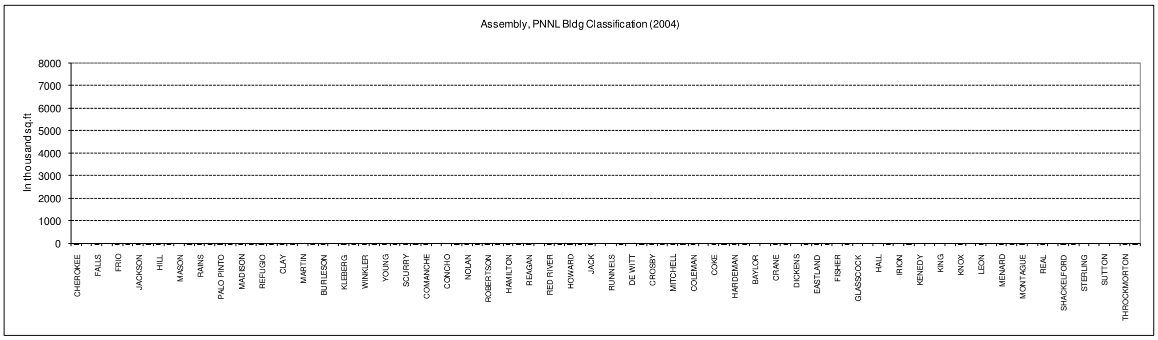
Table 55: New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2007). Table shows Dodge (2005) data merged into PNNL building types (sq. ft. x 1000) (Part 2).

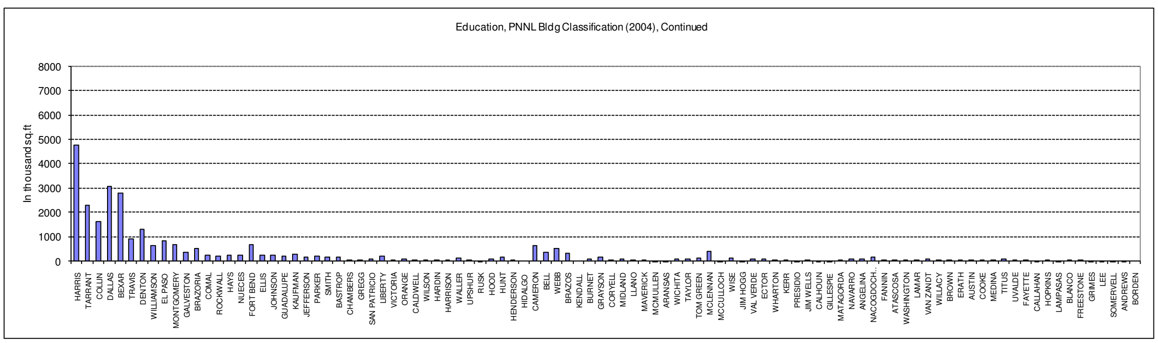
ERCOT Counties	Assembly	Education	Retail	Food	Lodging	Office	Warehouse	Stores and Restaurants
ANDERSON	12	9	19	5	15	16	11	28
ANDREWS	2	15	0	0	8	0	0	0
ANGELINA	56	89	76	20	49	35	11	134
ARANSAS	5	2	35	9	9	19	0	160
ARCHER	1	11	0	0	3	0	1	0
ATASCOSA	20	36	20	5	15	4	4	3
AUSTIN	1	57	1	0	7	1	291	0
BANDERA	2	40	0	0	4	5	0	0
BASTROP	0	0	0	0	0	0	0	29
BAYLOR	0	1	0	0	2	0	0	0
BEE	13	33	4	1	14	13	0	0
BELL	110	365	125	33	462	230	167	510
BEXAR	833	2,786	1,786	476	1,880	1,386	1,414	1,735
BLANCO	0	23	0	0	0	0	0	0
BORDEN	0	0	0	0	0	0	0	0
BOSQUE	1	16	0	0	0	1	0	0
BRAZORIA	128	500	324	87	78	95	158	514
BRAZOS	163	319	115	31	228	205	59	158
BREWSTER	5	11	0	0	6	10	6	0
BRISCOE	0	0	0	0	0	0	0	0
BROOKS	0	0	0	0	0	9	0	0
BROWN	9	23	12	3	19	16	10	105
BURLESON	1	13	1	0	3	9	0	0
BURNET	10	77	15	4	14	18	4	28
CALDWELL	0	0	0	0	0	0	0	4
CALHOUN	0	11	17	5	1	20	0	155
CALLAHAN	3	18	0	0	0	3	1	0
CAMERON	127	621	268	72	342	271	475	512
CHAMBERS	10	48	7	2	0	19	0	0
CHEROKEE	19	30	5	1	14	11	18	6
CHILDRESS	5	3	0	0	2	2	5	0
CLAY	1	5	0	0	0	8	0	0
COKE	3	3	0	0	0	0	1	0
COLEMAN	2	3	0	0	1	2	0	0
COLLIN	767	1,625	1,887	503	812	1,139	817	1,580
COLORADO	0	30	0	0	7	14	0	0
COMAL	38	220	108	29	71	78	42	152
COMANCHE	2	9	0	0	18	0	0	0
CONCHO	0	0	0	0	0	2	0	0
COOKE	10	36	24	6	32	8	9	0
CORYELL	13	35	19	5	17	4	7	155
COTTLE	0	2	0	0	0	0	0	0
CRANE	1	1	0	0	0	0	0	0
CROCKETT	3	2	0	0	0	0	0	0
CROSBY	2	1	0	0	2	0	0	0
CULBERSON	0	4	0	0	0	1	0	0
DALLAS	0	0	0	0	0	0	0	2,004
DAWSON	0	7	0	0	0	16	0	0
DE WITT	0	0	0	0	0	0	0	0
DELTA	1	9	0	0	0	0	0	0
DENTON	0	0	0	0	0	0	0	907
DICKENS	0	0	0	0	0	0	0	0
DIMMIT	0	7	0	0	0	16	0	0
DUVAL	0	20	1	0	0	4	0	0
EASTLAND	7	4	20	5	1	4	0	0
ECTOR	24	78	32	9	106	18	185	26
EDWARDS	0	0	0	0	0	0	0	0
ELLIS	86	219	118	31	40	48	561	87
ERATH	7	49	4	1	12	3	3	15
FALLS	3	13	0	0	0	6	0	0
FANNIN	10	35	5	1	7	4	8	0
FAYETTE	3	22	4	1	24	7	1	0
FISHER	0	3	0	0	2	0	0	0
FOARD	0	0	0	0	0	0	0	0
FORT BEND	0	0	0	0	0	0	0	370
FRANKLIN	2	0	0	0	1	1	106	0
FREESTONE	0	30	0	0	1	5	0	0
FRIO	1	29	7	2	4	1	0	0
GALVESTON	0	0	0	0	0	0	0	426
GILLESPIE	11	8	19	5	10	4	8	155
GLASSCOCK	0	0	0	0	0	0	0	0
GOLIAD	0	4	0	0	0	1	0	0
GONZALES	1	12	3	1	5	3	0	7
GRAYSON	37	162	62	17	50	24	130	103
GRIMES	5	12	0	0	0	6	0	0
GUADALUPE	27	181	89	24	48	84	183	387
HALL	0	1	0	0	0	0	0	0
HAMILTON	1	12	0	0	7	0	0	0
HARDEMAN	0	0	0	0	0	0	0	0
HARRIS	2,304	4,772	3,819	1,019	2,657	3,870	7,754	4,778
HASKELL	0	0	9	2	0	14	0	0
HAYS	85	248	137	36	67	155	73	405
HENDERSON	0	0	0	0	0	0	0	2
HIDALGO	0	0	0	0	0	0	0	943
HILL	6	74	10	3	4	1	0	0
HOOD	35	64	13	3	6	11	0	0
HOPKINS	8	25	15	4	8	3	18	3
HOUSTON	3	8	26	7	10	3	0	0
HOWARD	7	16	2	0	8	4	0	6
HUDSPETH	1	9	0	0	0	13	0	0
HUNT	31	151	26	7	25	33	20	15
IRION	0	0	0	0	0	0	0	0
JACK	1	1	0	0	0	17	0	0
JACKSON	2	22	1	0	0	1	0	0
JEFF DAVIS	6	0	0	0	0	2	0	0
JIM HOGG	0	8	0	0	1	10	0	0
JIM WELLS	0	49	22	6	23	7	4	3
JOHNSON	16	220	84	22	7	13	105	193
JONES	8	8	0	0	0	0	4	0
KARNES	0	10	0	0	2	7	0	0
KAUFMAN	43	262	63	17	12	32	174	194
KENDALL	0	0	0	0	0	0	0	9
KENEDY	0	0	0	0	0	1	0	0

Table 56: New Commercial Building Construction (sq. ft. x 1000) (Source: Dodge/McGraw-Hill 2007). Table shows Dodge (2005) data merged into PNNL building types (sq. ft. x 1000) (Part 3).

ERCOT Counties	Assembly	Education	Retail	Food	Lodging	Office	Warehouse	Stores and Restaurants
KENT	0	0	0	0	2	0	0	0
KERR	43	50	23	6	53	26	0	0
KIMBLE	2	0	0	0	0	2	0	0
KING	0	0	0	0	0	0	0	0
KINNEY	0	3	0	0	0	23	0	0
KLEBERG	7	48	41	11	10	7	1	160
KNOX	1	1	0	0	0	0	0	0
LA SALLE	0	2	1	0	2	1	0	0
LAMAR	7	52	9	2	4	9	3	10
LAMPASAS	2	10	12	3	7	4	0	2
LAVACA	15	4	0	0	2	4	0	0
LEE	1	17	1	0	0	6	1	12
LEON	7	7	0	0	0	0	0	0
LIMESTONE	4	7	12	3	4	11	1	0
LIVE OAK	3	0	0	0	0	0	0	0
LLANO	0	20	0	0	47	4	0	0
LOVING	0	0	0	0	0	0	0	0
MADISON	1	19	0	0	0	1	0	0
MARTIN	0	0	0	0	0	0	0	0
MASON	0	3	0	0	0	5	0	0
MATAGORDA	5	32	6	2	11	8	8	0
MAVERICK	17	54	15	4	37	32	1	30
MCCULLOCH	1	13	0	0	0	0	0	0
MCLENNAN	105	393	147	39	180	136	179	148
MCMULLEN	2	1	0	0	0	1	0	0
MEDINA	8	50	2	1	0	27	2	0
MENARD	0	1	0	0	0	0	0	0
MIDLAND	94	62	95	25	54	63	19	188
MILAM	3	39	10	3	0	19	0	100
MILLS	2	8	0	0	0	1	0	0
MITCHELL	4	0	0	0	5	14	0	0
MONTAGUE	1	13	10	3	6	5	1	100
MONTGOMERY	0	0	0	0	0	0	0	452
MOTLEY	0	1	0	0	0	0	0	0
NACOGDOCHES	30	165	27	7	38	19	19	0
NAVARRO	7	70	42	11	32	4	80	215
NOLAN	6	17	10	3	8	0	0	100
NUECES	0	0	0	0	0	0	0	103
PALO PINTO	6	37	21	6	4	4	2	203
PARKER	13	182	99	26	52	12	9	532
PECOS	5	9	0	0	14	16	0	0
PRESIDIO	5	9	0	0	0	3	1	0
RAINS	2	21	0	0	0	3	0	0
REAGAN	1	0	0	0	0	5	0	0
REAL	0	1	0	0	4	1	0	0
RED RIVER	3	27	0	0	0	1	0	0
REEVES	5	2	0	0	4	47	0	5
REFUGIO	2	1	0	0	0	3	0	0
ROBERTSON	2	4	0	0	2	0	2	0
ROCKWALL	34	203	123	33	20	34	47	152
RUNNELS	0	6	1	0	0	2	0	0
RUSK	1	12	21	6	2	5	5	140
SAN PATRICIO	20	83	34	9	28	111	355	161
SAN SABA	4	3	1	0	0	0	0	0
SCHLEICHER	0	0	0	0	0	0	0	0
SCURRY	0	0	2	1	1	1	6	0
SHACKELFORD	2	4	0	0	2	0	0	0
SMITH	114	163	125	33	173	174	210	64
SOMERVELL	0	9	0	0	1	6	1	0
STARR	9	172	3	1	6	9	0	0
STEPHENS	0	6	0	0	1	0	0	0
STERLING	0	0	0	0	0	0	0	0
STONEWALL	0	0	0	0	0	0	0	0
SUTTON	0	7	0	0	5	3	0	0
TARRANT	1,077	2,284	2,435	650	1,465	1,317	2,740	2,836
TAYLOR	51	74	120	32	90	48	78	384
TERRELL	0	0	0	0	0	10	0	0
THROCKMORTON	1	0	0	0	0	1	0	0
TITUS	16	97	26	7	0	8	0	0
TOM GREEN	84	122	71	19	154	55	45	158
TRAVIS	534	890	1,096	292	1,107	894	675	1,436
UPTON	0	0	0	0	1	0	0	0
UVALDE	12	27	28	7	4	6	7	236
VAL VERDE	18	61	15	4	18	56	7	5
VAN ZANDT	3	84	0	0	0	2	1	0
VICTORIA	0	0	0	0	0	0	0	15
WALLER	27	101	4	1	0	3	117	22
WARD	0	0	0	0	0	53	1	0
WASHINGTON	26	31	28	8	10	11	21	253
WEBB	52	517	101	27	179	148	222	33
WHARTON	13	23	42	11	9	9	16	29
WICHITA	88	75	75	20	247	84	42	103
WILBARGER	3	7	9	2	11	17	1	0
WILLACY	2	37	23	6	1	23	6	4
WILLIAMSON	189	649	496	132	200	219	193	946
WILSON	0	0	0	0	0	0	0	74
WINKLER	1	0	0	0	0	0	0	0
WISE	28	110	1	0	71	29	0	0
YOUNG	7	14	16	4	4	3	1	0
ZAPATA	2	40	1	0	1	12	0	0
ZAVALA	0	16	0	0	4	4	1	0
TOTAL (ERCOT COUNTIES)	7,997	21,378	14,943	3,986	11,682	11,987	17,973	26,415







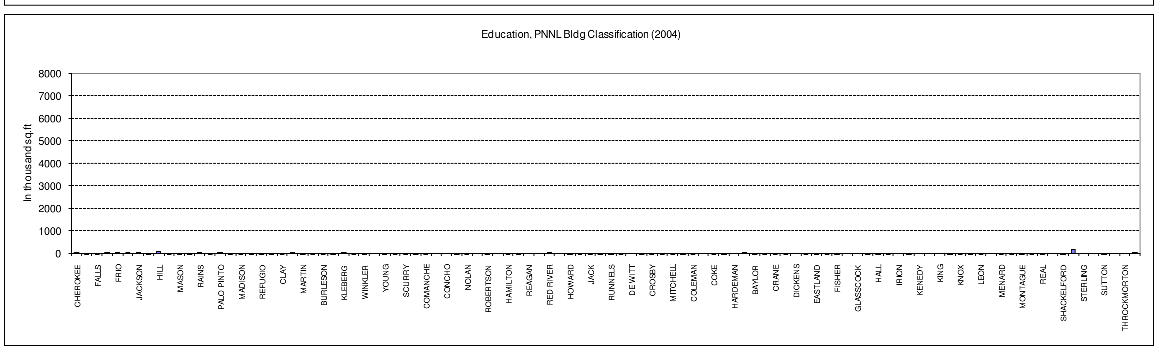
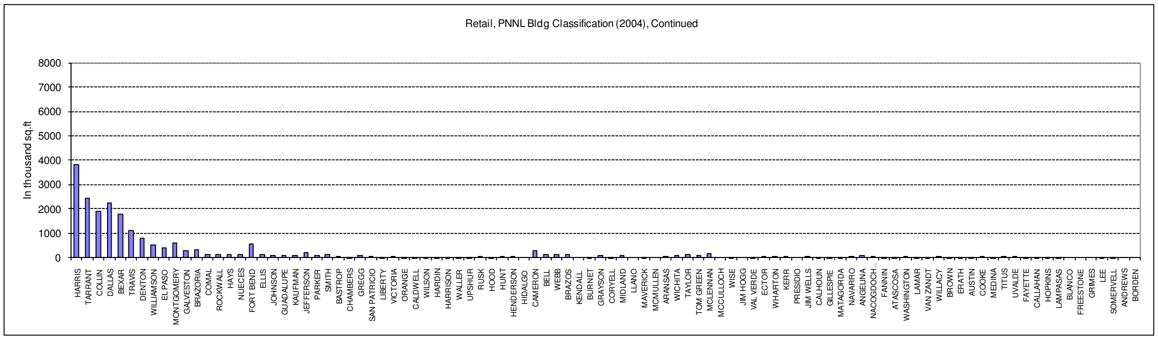
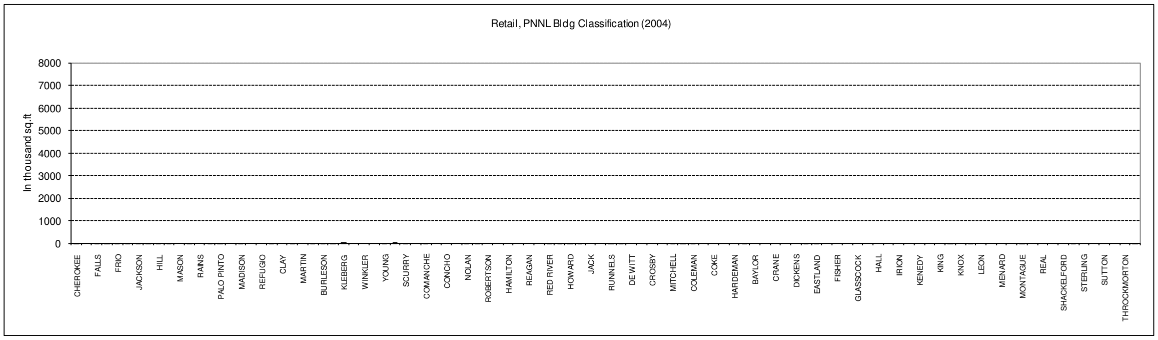
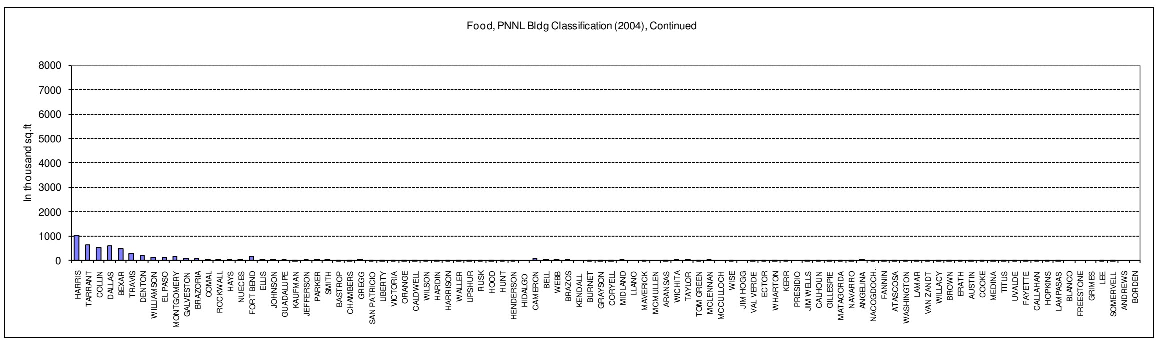


Figure 100: New Commercial Building Construction (sq. ft. x 1000), Part 1 (Dodge 2005).







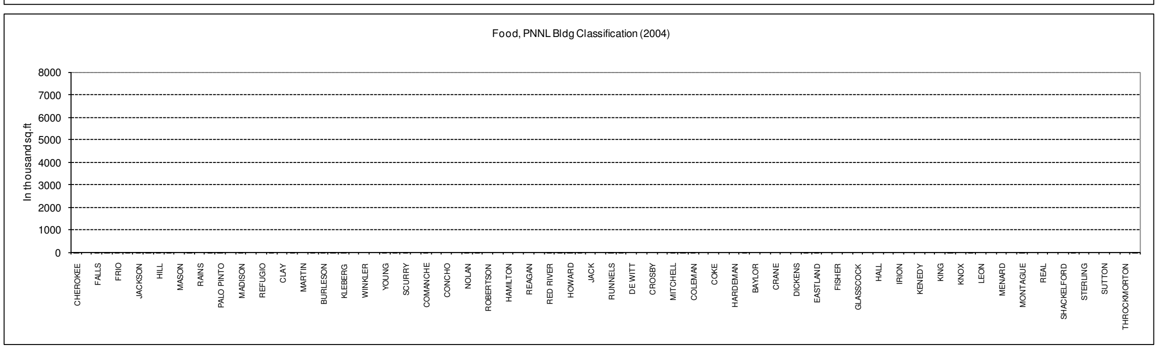


Figure 101: New Commercial Building Construction (sq. ft. x 1000), Part 2 (Dodge 2005).

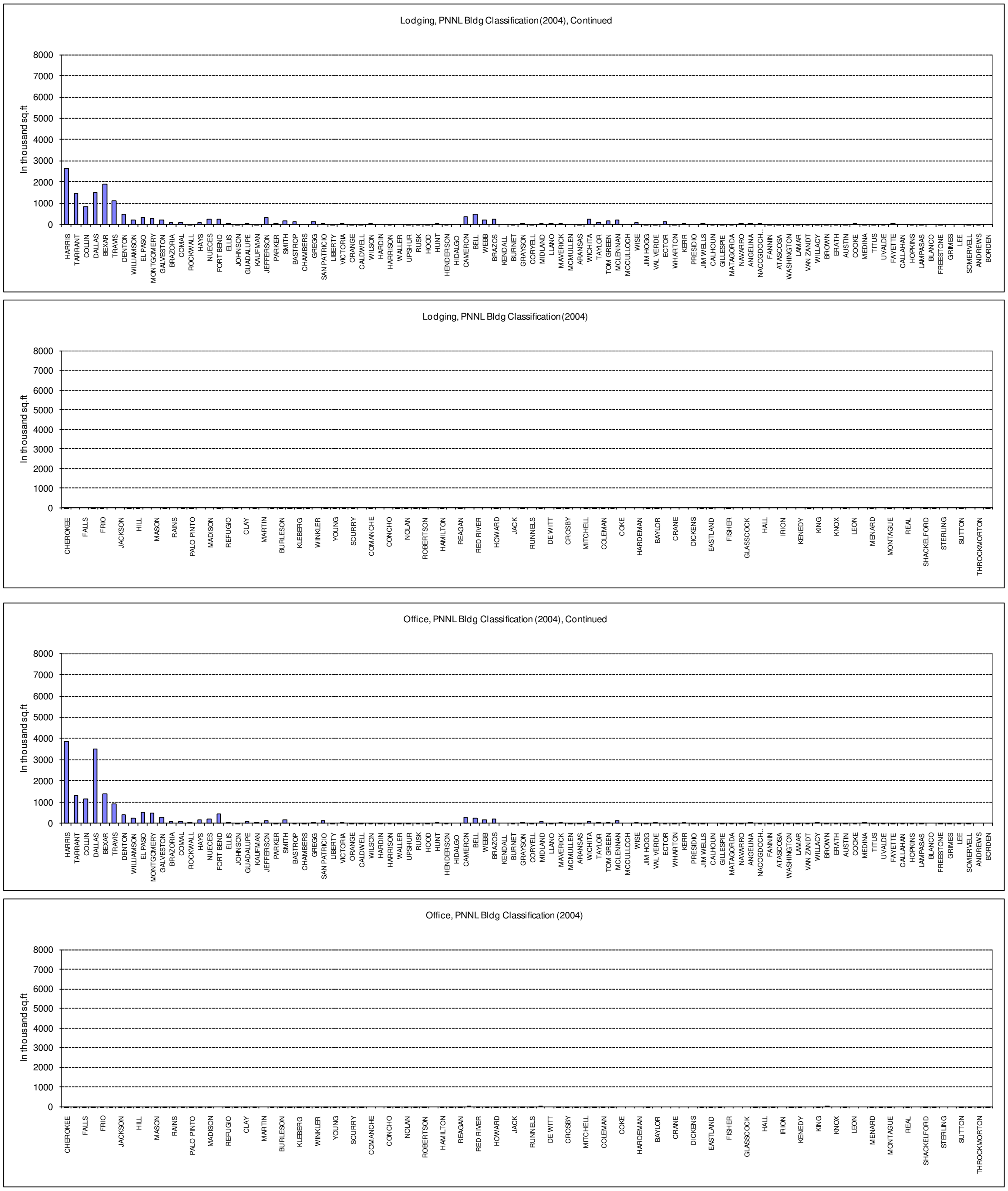
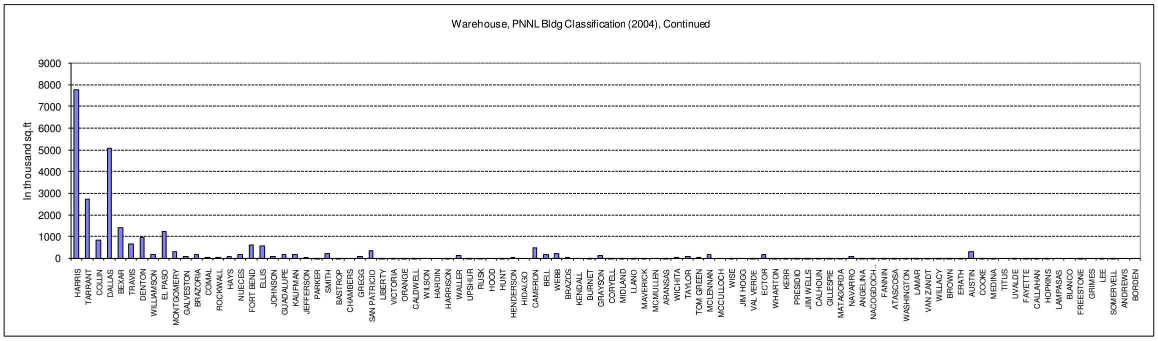


Figure 102: New Commercial Building Construction (sq. ft. x 1000), Part 3 (Dodge 2005).



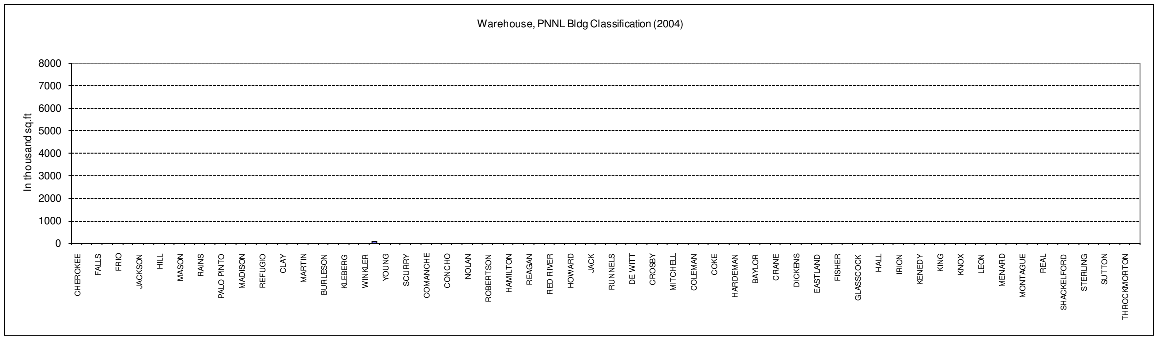


Figure 103: New Commercial Building Construction (sq. ft. x 1000), Part 4(Dodge 2005).

Table 57: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Assembly, Education, and Retail Building Types (USDOE 2004) (Part 1)

Assembly

Non-attainment Counties	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
Brazoria	128	2292178	7712.3	2074691	6601	4127	6	4345	3
Chambers	10	175808	591.5	159127	506	317	0	333	0
Collin	767	13699523	46093.8	12399682	39454	24667	38	25970	16
Dallas	1585	28324692	95302.1	25637183	81575	51000	79	53694	33
Denton	414	7401837	24904.4	6699534	21317	13327	21	14031	9
El Paso	324	5798935	19511.3	5248719	16701	10441	16	10993	7
Fort Bend	261	4661737	15685.0	4219421	13426	8394	13	8837	5
Galveston	143	2558799	8609.4	2316014	7369	4607	7	4851	3
Hardin	9	161875	544.7	146516	466	291	0	307	0
Harris	2304	41169939	138521.6	37263645	118569	74128	114	78045	48
Jefferson	112	2008728	6758.6	1818135	5785	3617	6	3808	2
Liberty	5	87739	295.2	79414	253	158	0	166	0
Montgomery	249	4450144	14973.1	4027904	12816	8013	12	8436	5
Orange	9	163811	551.2	148268	472	295	0	311	0
Tarrant	1077	19244509	64750.7	17418547	55424	34651	53	36481	23
Waller	27	479012	1611.7	433562	1380	862	1	908	1
Total (Non-attainment)	7424	132679265	446417	120090364	382114	238895	368	251516	155

Education

Non-attainment Counties	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
Brazoria	500	5176293	17416	4586791	14595	9431	15	10026	6
Chambers	48	501232	1686	444149	1413	913	1	971	1
Collin	1625	16821626	56599	14905895	47429	30648	47	32581	20
Dallas	3083	31912479	107374	28278126	89978	58142	90	61810	38
Denton	1318	13641013	45897	12087506	38461	24853	38	26421	16
El Paso	822	8505379	28617	7536744	23981	15496	24	16474	10
Fort Bend	676	6993917	23532	6197415	19719	12742	20	13546	8
Galveston	336	3476477	11697	3080559	9802	6334	10	6734	4
Hardin	55	573972	1931	508606	1618	1046	2	1112	1
Harris	4772	49401692	166218	43775581	139289	90006	139	95685	59
Jefferson	150	1548970	5212	1372566	4367	2822	4	3000	2
Liberty	178	1846053	6211	1635815	5205	3363	5	3576	2
Montgomery	675	6986286	23506	6190653	19698	12728	20	13532	8
Orange	88	911443	3067	807643	2570	1661	3	1765	1
Tarrant	2284	23646868	79563	20953845	66673	43083	66	45801	28
Waller	101	1042019	3506	923349	2938	1898	3	2018	1
Total (Non-attainment)	16711	172985720	582033	153285242	487736	315166	485	335052	207

Retail

Non-attainment Counties	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
Brazoria	324	5382074	18109	4534355	14428	1281	2	1677	1
Chambers	7	124302	418	104724	333	30	0	39	0
Collin	1887	31303337	105324	26372815	83915	7452	11	9754	6
Dallas	2236	37106194	124849	31261676	99471	8834	14	11562	7
Denton	786	13042883	43884	10988526	34964	3105	5	4064	3
El Paso	378	6268822	21092	5281433	16805	1492	2	1953	1
Fort Bend	563	9337816	31418	7867037	25032	2223	3	2910	2
Galveston	295	4891953	16460	4121432	13114	1165	2	1524	1
Hardin	19	316313	1064	266491	848	75	0	99	0
Harris	3819	63362120	213190	53382087	169856	15085	23	19744	12
Jefferson	210	3491287	11747	2941382	9359	831	1	1088	1
Liberty	14	225968	760	190376	606	54	0	70	0
Montgomery	578	9586539	32255	8076584	25699	2282	4	2987	2
Orange	14	239772	807	202006	643	57	0	75	0
Tarrant	2435	40397656	135923	34034707	108295	9617	15	12588	8
Waller	4	70849	238	59690	190	17	0	22	0
Total (Non-attainment)	13570	225147884	757539	189685320	603557	53601	83	70156	43

Assembly

Affected Counties	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
Bastrop	16	277226	932.8	250922	798	499	1	526	0
Bexar	833	14880608	50067.7	13468703	42856	26793	41	28209	17
Caldwell	1	22872	77.0	20702	66	41	0	43	0
Comal	38	675299	2272.1	611225	1945	1216	2	1280	1
Ellis	86	1534805	5164.1	1389179	4420	2763	4	2909	2
Gregg	81	1438813	4841.1	1302295	4144	2591	4	2728	2
Guadalupe	27	479430	1613.1	433941	1381	863	1	909	1
Harrison	20	361512	1216.4	327211	1041	651	1	685	0
Hays	85	1510922	5083.7	1367562	4351	2720	4	2864	2
Henderson	10	175814	591.5	159132	506	317	0	333	0
Hood	35	627689	2111.9	568133	1808	1130	2	1190	1
Hunt	31	557255	1875.0	504381	1605	1003	2	1056	1
Johnson	16	277394	933.3	251074	799	499	1	526	0
Kaufman	43	777131	2614.8	703395	2238	1399	2	1473	1
Nueces	149	2659418	8948.0	2407086	7659	4788	7	5041	3
Parker	13	238427	802.2	215805	687	429	1	452	0
Rockwall	34	608692	2048.0	550938	1753	1096	2	1154	1
Rusk	1	20580	69.2	18627	59	37	0	39	0
San Patricio	20	350543	1179.4	317283	1010	631	1	665	0
Smith	114	2042049	6870.7	1848295	5881	3677	6	3871	2
Travis	534	9540320	32099.7	8635114	27476	17178	26	18085	11
Upshur	16	291956	982.3	264254	841	526	1	553	0
Victoria	30	530122	1783.7	479823	1527	955	1	1005	1
Williamson	189	3384484	11387.5	3063357	9747	6094	9	6416	4
Wilson	5	90162	303.4	81608	260	162	0	171	0
Total (Affected)	2426	43353525	145869	39240047	124857	78060	120	82184	51

Education

Affected Counties	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
Bastrop	150	1555780	5235	1378600	4387	2835	4	3013	2
Bexar	2786	28841392	97041	25556790	81319	52547	81	55862	35
Caldwell	36	377427	1270	334443	1064	688	1	731	0
Comal	220	2273948	7651	2014979	6411	4143	6	4404	3
Ellis	219	2265517	7623	2007509	6388	4128	6	4388	3
Gregg	56	580435	1953	514332	1637	1058	2	1124	1
Guadalupe	181	1869435	6290	1656534	5271	3406	5	3621	2
Harrison	31	324176	1091	287257	914	591	1	628	0
Hays	248	2563995	8627	2271994	7229	4671	7	4966	3
Henderson	49	507854	1709	450017	1432	925	1	984	1
Hood	64	659156	2218	584088	1859	1201	2	1277	1
Hunt	151	1563045	5259	1385038	4407	2848	4	3027	2
Johnson	220	2280505	7673	2020790	6430	4155	6	4417	3
Kaufman	262	2707317	9109	2398994	7633	4933	8	5244	3
Nueces	221	2282700	7680	2022735	6436	4159	6	4421	3
Parker	182	1884766	6342	1670119	5314	3434	5	3651	2
Rockwall	203	2103845	7079	1864249	5932	3833	6	4075	3
Rusk	12	126205	425	111832	356	230	0	244	0
San Patricio	83	860943	2897	762895	2427	1569	2	1668	1
Smith	163	1684625	5668	1492772	4750	3069	5	3263	2
Travis	890	9212446	30996	8163287	25975	16784	26	17843	11
Upshur	43	448095	1508	397064	1263	816	1	868	1
Victoria	28	292059	983	258797	823	532	1	566	0
Williamson	649	6718541	22605	5953400	18943	12241	19	13013	8
Wilson	54	558014	1878	494465	1573	1017	2	1081	1
Total (Affected)	7201	74542221	250807	66052980	210173	135810	209	144379	89

Retail

Affected Counties	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
Bastrop	46	762931	2567	642763	2045	182	0	238	0
Bexar	1786	29628159	99688	24961491	79425	7054	11	9232	6
Caldwell	7	122968	414	103599	330	29	0	38	0
Comal	108	1792277	6030	1509979	4805	427	1	558	0
Ellis	118	1951536	6566	1644154	5232	465	1	608	0
Gregg	75	1245189	4190	1049062	3338	296	0	388	0
Guadalupe	89	1475603	4965	1243184	3956	351	1	460	0
Harrison	16	273116	919	230098	732	65	0	85	0
Hays	137	2269537	7636	1912067	6084	540	1	707	0
Henderson	21	343665	1156	289535	921	82	0	107	0
Hood	13	212349	714	178902	569	51	0	66	0
Hunt	26	437016	1470	368182	1172	104	0	136	0
Johnson	84	1396612	4699	1176635	3744	332	1	435	0
Kaufman	63	1044379	3514	879881	2800	249	0	325	0
Nueces	103	1702194	5727	1434085	4563	405	1	530	0
Parker	99	1638128	5512	1380110	4391	390	1	510	0
Rockwall	123	2039263	6861	1718063	5467	485	1	635	0
Rusk	21	355014	1194	299096	952	85	0	111	0
San Patricio	34	558687	1880	470689	1498	133	0	174	0
Smith	125	2066730	6954	1741203	5540	492	1	644	0
Travis	1096	18177379	61160	15314298	48728	4327	7	5664	3
Upshur	6	93601	315	78858	251	22	0	29	0
Victoria	51	847854	2853	714311	2273	202	0	264	0
Williamson	496	8234055	27705	6937126	22073	1960	3	2566	2
Wilson	10	173897	585	146507	466	41	0	54	0
Total (Affected)	4752	78842138	265275	66423880	211353	18770	29	24567	15

Table 58: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Assembly, Education, and Retail Building Types (USDOE 2004). (Part 2)

ERCOT Counties	Assembly									Education									Retail								
	In thousand	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL				In thousand	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL				In thousand	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
	sq.ft	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	sq.ft	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	sq.ft	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
ANDERSON	12	210809	709.3	190807	607	380	1	400	0	9	95462	321	84591	269	174	0	185	0	19	316160	1064	266362	848	75	0	99	0
ANDREWS	2	32284	108.6	29221	93	58	0	61	0	15	157247	529	139339	443	286	0	305	0	0	0	0	0	0	0	0	0	0
ANGELINA	56	999461	3362.8	904630	2878	1800	3	1895	1	89	919785	3095	815035	2593	1676	3	1782	1	76	1262235	4247	1063423	3384	300	0	393	0
ARANSAS	5	93510	314.6	84637	269	168	0	177	0	2	19019	64	16853	54	35	0	37	0	35	576029	1938	485300	1544	137	0	179	0
ARCHER	1	14205	47.8	12857	41	26	0	27	0	11	113922	383	100948	321	208	0	221	0	0	0	0	0	0	0	0	0	0
ATASCOSA	20	351944	1184.2	318551	1014	634	1	667	0	36	376433	1267	333563	1061	686	1	729	0	20	324336	1091	273251	869	77	0	101	0
AUSTIN	1	14947	50.3	13529	43	27	0	28	0	57	586401	1973	519619	1653	1068	2	1136	1	1	19423	65	16364	52	5	0	6	0
BANDERA	2	29894	100.6	27057	86	54	0	57	0	40	414609	1395	367391	1169	755	1	803	0	0	525	2	442	1	0	0	0	0
Bastrop	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BAYLOR	0	0	0.0	0	0	0	0	0	0	1	13545	46	12002	38	25	0	26	0	0	0	0	0	0	0	0	0	0
BEE	13	227043	763.9	205501	654	409	1	430	0	33	337309	1135	298894	951	615	1	653	0	4	60701	204	51140	163	14	0	19	0
BELL	110	1973184	6639.0	1785964	5683	3553	5	3741	2	365	3783186	12729	3352338	10667	6893	11	7328	5	125	2070682	6967	1744533	5551	493	1	645	0
Bexar	833	14880608	50067.7	13468703	42856	26793	41	28209	17	2786	28841392	97041	25556790	81319	52547	81	55862	35	1786	29628159	99688	24961491	79425	7054	11	9232	6
BLANCO	0	3228	10.9	2922	9	6	0	6	0	23	234701	790	207972	662	428	1	455	0	0	0	0	0	0	0	0	0	0
BORDEN	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSQUE	1	16718	56.2	15132	48	30	0	32	0	16	166996	562	147978	471	304	0	323	0	0	0	0	0	0	0	0	0	0
Brazoria	128	2292178	7712.3	2074691	6601	4127	6	4345	3	500	5176293	17416	4586791	14595	9431	15	10026	6	324	5382074	18109	4534355	14428	1281	2	1677	1
BRAZOS	163	2915578	9809.8	2638941	8397	5250	8	5527	3	319	3304654	11119	2928303	9318	6021	9	6401	4	115	1910896	6429	1609915	5123	455	1	595	0
BREWSTER	5	81282	273.5	73570	234	146	0	154	0	11	114483	385	101445	323	209	0	222	0	0	0	0	0	0	0	0	0	0
BRISCOE	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BROOKS	0	3191	10.7	2889	9	6	0	6	0	0	0	0	0	0	0	0	0	0	0	7877	27	6636	21	2	0	2	0
BROWN	9	152682	513.7	138195	440	275	0	289	0	23	240646	810	213240	679	438	1	466	0	12	201317	677	169608	540	48	0	63	0
BURLESON	1	22341	75.2	20221	64	40	0	42	0	13	133779	450	118544	377	244	0	259	0	1	9267	31	7808	25	2	0	3	0
BURNET	10	182400	613.7	165093	525	328	1	346	0	77	796889	2681	706135	2247	1452	2	1543	1	15	253552	853	213616	680	60	0	79	0
Caldwell	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CALHOUN	0	760	2.6	688	2	1	0	1	0	11	109250	368	96808	308	199	0	212	0	17	288383	970	242960	773	69	0	90	0
CALLAHAN	3	50151	168.7	45393	144	90	0	95	0	18	181279	610	160634	511	330	1	351	0	0	4016	14	3383	11	1	0	1	0
CAMERON	127	2274860	7654.1	2059016	6552	4096	6	4312	3	621	6423381	21612	5691855	18111	11703	18	12441	8	268	4451930	14979	3750716	11934	1060	2	1387	1
Chambers	10	175808	591.5	159127	506	317	0	333	0	48	501232	1686	444149	1413	913	1	971	1	7	124302	418	104724	333	30	0	39	0
CHEROKEE	19	347559	1169.4	314582	1001	626	1	659	0	30	307614	1035	272581	867	560	1	596	0	5	85111	286	71705	228	20	0	27	0
CHILDRESS	5	82773	278.5	74919	238	149	0	157	0	3	35068	118	31075	99	64	0	68	0	0	0	0	0	0	0	0	0	0
CLAY	1	10031	33.7	9079	29	18	0	19	0	5	51383	173	45531	145	94	0	100	0	0	0	0	0	0	0	0	0	0
COKE	3	60371	203.1	54643	174	109	0	114	0	3	33955	114	30088	96	62	0	66	0	0	0	0	0	0	0	0	0	0
COLEMAN	2	31257	105.2	28292	90	56	0	59	0	3	30599	103	27114	86	56	0	59	0	0	4865	16	4099	13	1	0	2	0
Collin	767	13699523	46093.8	12399682	39454	24667	38	25970	16	1625	16821626	56599	14905895	47429	30648	47	32581	20	1887	31303337	105324	26372815	83915	7452	11	9754	6
COLORADO	0	0	0.0	0	0	0	0	0	0	30	311894	1049	276374	879	568	1	604	0	0	6642	22	5596	18	2	0	2	0
Comal	38	675299	2272.1	611225	1945	1216	2	1280	1	220	2273948	7651	2014979	6411	4143	6	4404	3	108	1792277	6030	1509979	4805	427	1	558	0
COMANCHE	2	31156	104.8	28199	90	56	0	59	0	9	94054	316	83342	265	171	0	182	0	0	4402	15	3709	12	1	0	1	0
CONCHO	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COOKE	10	184119	619.5	166649	530	332	1	349	0	36	377608	1271	334604	1065	688	1	731	0	24	398509	1341	335741	1068	95	0	124	0
CORYELL	13	234330	788.4	212096	675	422	1	444	0	35	362588	1220	321295	1022	661	1	702	0	19	318571	1072	268393	854	76	0	99	0
COTTLE	0	0	0.0	0	0	0	0	0	0	2	15771	53	13975	44	29	0	31	0	0	0	0	0	0	0	0	0	0
CRANE	1	25119	84.5	22736	72	45	0	48	0	1	14102	47	12496	40	26	0	27	0	0	0	0	0	0	0	0	0	0
CROCKETT	3	53522	180.1	48444	154	96	0	101	0	2	16699	56	14797	47	30	0	32	0	0	0	0	0	0	0	0	0	0
CROSBY	2	31906	107.4	28879	92	57	0	60	0	1	5566	19	4933	16	10	0	11	0	0	0	0	0	0	0	0	0	0
CULBERSON	0	6079	20.5	5502	18	11	0	12	0	4	43103	145	38194	122	79	0	83	0	0	3089	10	2603	8	1	0	1	0
Dallas	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAWSON	0	7110	23.9	6435	20	13	0	13	0	7	69580	234	61656	196	127	0	135	0	0	0	0	0	0	0	0	0	0
DE WITT	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DELTA	1	13678	46.0	12380	39	25	0	26	0	9	90918	306	80564	256	166	0	176	0	0	0	0	0	0	0	0	0	0
Denton	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DICKENS	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIMMIT	0	0	0.0	0	0	0	0	0	0	7	75757	255	67130	214	138	0	147	0	0	0	0	0	0	0	0	0	0
DUVAL	0	3799	12.8	3439	11	7	0	7	0	20	211498	712	187412	596	385	1	410	0	1	13038	44	10985	35	3	0	4	0
EASTLAND	7	127633	429.4	115523	368	230	0	242	0	4	38973	131	34535	110	71	0	75	0	20	328893	1107	277090	882	78	0	102	0
ECTOR	24	420339	1414.3	380456	1211	757	1	797	0	78	809416	2723	717236	2282	1475	2	1568	1	32	535325	1801	451007	1435	127	0	167	0
EDWARDS	0	2736	9.2	2476	8	5	0	5	0	0	4824	16	4275	14	9	0	9	0	0	0	0	0	0	0	0	0	0
Ellis	86	1534805	5164.1	1389179	4420	2763	4	2909	2	219	2265517	7623	2007509	6388	4128	6	4388	3	118	1951536	6566	1644154	5232	465	1	608	0
ERATH	7	118101	397.4	106895	340	213	0	224	0	49	503751	1695	446381	1420	918	1	976	1	4	62855	211	52955	168	15	0	20	0
FALLS	3	59753	201.0	54084	172	108	0	113	0	13	133408	449	118215	376	243	0	258	0	0	6845	23	5767	18	2	0	2	0
FANNIN	10	175513	590.5	158860	505	316	0	333	0	35	366661	1234	324903	1034	668	1	710	0	5	88735	299	74759	238	21	0	28	0
FAYETTE	3	59075	198.8	53470	170	106	0	112	0	22	228852	770	202789	645	417	1	443	0	4	74449	250	62723	200	18	0	23	0
FISHER	0	0	0.0	0	0	0	0	0	0	3	35161	118	31157	99	64	0	68	0	0	0	0	0	0	0	0	0	0
FOARD	0	3169	10.7	2869	9	6	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fort Bend	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRANKLIN	2	27709	93.2	25080	80	50	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FREESTONE	0	0	0.0	0	0	0	0	0	0	30	315026	1060	279149	888	574	1	610	0	0	0	0	0	0	0	0	0	0
FRIO	1	16373	55.1	14820	47	29	0	31	0	29	295113	993	261504	832	538	1	572	0	7	115070	387	96946	308	27	0	36	0
Galveston	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GILLESPIE	11	202136	680.1	182957	582	364	1	383	0	8	85630	288	75878	241	156	0	166	0	19	313473	1055	264099	840	75	0	98	0
GLASSCOCK	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLIAD	0	0	0.0	0	0	0	0	0	0	4	45234	152	40083	128	82	0	88	0	0	0	0	0	0	0	0	0	0
GONZALES	1	26435	88.9	23926	76	48	0	50	0	12	121946	410	108058	344	222	0	236	0	3	44033	148	37098	118	10	0	14	0
GRAYSON	37	653917	2200.2	591872	1883	1177	2	1240	1	162	1678335	5647	1487198	4732	3058	5	3251	2	62	1035638	3485	872516	2776	247	0	323	0
GRIMES	5	82151	276.4	74356	237	148	0	156	0	12	121939	410	108052	344	222	0	236	0	0	0	0	0	0	0	0	0	0
Guadalupe	27	479430	1613.1	433941	1381	863	1	909	1	181	1869435	6290	1656534	5271	3406	5	3621	2	89	1475603	4965	1243184	3956	351	1	460	0
HALL	0	0	0.0	0	0	0	0	0	0	1	5566	19	4933	16	10	0	11	0	0	0	0	0	0	0	0	0	0
HAMILTON	1	12158	40.9	11005	35	22	0	23	0	12	120884	407	107117	341	220	0	234	0	0	0	0	0	0	0	0	0	0
HARDEMAN	0	8511	28.6	7703	25	15	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harris	2304	41169939	138521.6	37263645	118569	74128	114	78045	48	4772	49401692	166218	43775581	139289	90006	139	95685	59	3819	63362120	213190	53382087	169856	15085	23	19744	12
HASKELL	0	3040	10.2	2751	9	5	0	6	0	0	0	0	0	0	0	0	0	0	9	142865	481	120362	383	34	0	45	0
Hays	85	1510922	5083.7	1367562	4351	2720	4	2864	2	248	2563995	8627	2271994	7229	4671	7	4966	3	137	2269537	7636	1912067	6084	540	1	707	0
Henderson	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HIDALGO	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HILL	6	112168	377.4	101525	323	202	0	213	0	74	764623	2573	677544	2156	1393	2	1481	1	10	173229	583	145944	464	41	0	54	0
Hood	35	627689	2111.9	568133	1808	1130	2	1190	1	64	659156	2218	584088	1859	1201	2	1277	1	13	212349	714	178902	569	51	0	66	0
HOPKINS	8	134799	453.5	122009	388	243	0	256	0	25	257858	868	228492	727	470	1	499	0	15	253869	854	213882	681	60	0	79	0
HOUSTON	3	49403	166.2	44716	142	89	0	94	0	8	84702	285	75056	239	154	0	164	0	26	431166	1451	363254	1156	103	0	134	0
HOWARD	7	119695	402.7	108338	345	216	0	227	0	16	167271	563	148221	472	305	0	324	0	2	29120	98	24533	78	7	0	9	0
HUDSPETH	1	11622	39.1	10520	33	21	0	22	0	9	89856	302	79623	253	164	0	174	0	0	0	0	0	0	0	0	0	0
Hunt	31	557255	1875.0	504381	1605	1003	2	1056	1	151	1563045	5259	1385038	4407	2848	4	3027	2	26	437016	1470	368182	1172	104	0	136	0
IRION	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JACK	1	22797	76.7	20634	66	41	0	43	0	1	9834	33	8714	28	18	0	19	0	0	0	0	0	0	0	0	0	0
JACKSON	2	32998	111.0	29867	95	59	0	63	0	22	226248	761	200482	638	412	1	438	0	1	13051	44	10996	35	3	0	4	0
JEFF DAVIS	6	113331	381.3	102578	326	204	0	215	0	0	1484	5	1315	4	3	0	3	0	0	0	0	0	0	0	0	0	0
JIM HOGG	0	7655	25.8	6928	22	14	0	15	0	8	85554	288	75811	241	156	0	166	0	0	0	0	0	0	0	0	0	0

Table 59: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Assembly, Education, and Retail Building Types (USDOE 2004). (Part 3)

ERCOT Counties	Assembly									Education									Retail								
	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL				In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL				In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
JIM WELLS	0	3952	13.3	3577	11	7	0	7	0	49	505484	1701	447917	1425	921	1	979	1	22	369225	1242	311069	990	88	0	115	0
Johnson	16	277394	933.3	251074	799	499	1	526	0	220	2280505	7673	2020790	6430	4155	6	4417	3	84	1396612	4699	1176635	3744	332	1	435	0
JONES	8	144631	486.6	130908	417	260	0	274	0	8	87407	294	77452	246	159	0	169	0	0	0	0	0	0	0	0	0	0
KARNES	0	0	0.0	0	0	0	0	0	0	10	101783	342	90191	287	185	0	197	0	0	2703	9	2277	7	1	0	1	0
Kaufman	43	777131	2614.8	703395	2238	1399	2	1473	1	262	2707317	9109	2398994	7633	4933	8	5244	3	63	1044379	3514	879881	2800	249	0	325	0
KENDALL	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENEDY	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENT	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KERR	43	759912	2556.8	687810	2189	1368	2	1441	1	50	513000	1726	454577	1446	935	1	994	1	23	374653	1261	315642	1004	89	0	117	0
KIMBLE	2	28876	97.2	26136	83	52	0	55	0	0	2783	9	2466	8	5	0	5	0	0	0	0	0	0	0	0	0	0
KING	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KINNEY	0	0	0.0	0	0	0	0	0	0	3	31830	107	28205	90	58	0	62	0	0	7334	25	6179	20	2	0	2	0
KLEBERG	7	133040	447.6	120417	383	240	0	252	0	48	499942	1682	443006	1410	911	1	968	1	41	686211	2309	578128	1840	163	0	214	0
KNOX	1	15198	51.1	13756	44	27	0	29	0	1	12988	44	11509	37	24	0	25	0	0	0	0	0	0	0	0	0	0
LA SALLE	0	0	0.0	0	0	0	0	0	0	2	19297	65	17099	54	35	0	37	0	1	9962	34	8393	27	2	0	3	0
LAMAR	7	130100	437.7	117756	375	234	0	247	0	52	534121	1797	473292	1506	973	1	1035	1	9	150883	508	127118	404	36	0	47	0
LAMPASAS	2	33416	112.4	30245	96	60	0	63	0	10	101680	342	90100	287	185	0	197	0	12	204514	688	172301	548	49	0	64	0
LAVACA	15	269366	906.3	243808	776	485	1	511	0	4	45384	153	40215	128	83	0	88	0	0	5020	17	4229	13	1	0	2	0
LEE	1	15755	53.0	14260	45	28	0	30	0	17	173705	584	153923	490	316	0	336	0	1	19069	64	16065	51	5	0	6	0
LEON	7	122663	412.7	111024	353	221	0	233	0	7	69157	233	61281	195	126	0	134	0	0	0	0	0	0	0	0	0	0
LIMESTONE	4	64425	216.8	58312	186	116	0	122	0	7	69279	233	61389	195	126	0	134	0	12	191638	645	161454	514	46	0	60	0
LIVE OAK	3	62007	208.6	56124	179	112	0	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LLANO	0	8888	29.9	8045	26	16	0	17	0	20	211338	711	187270	596	385	1	409	0	0	0	0	0	0	0	0	0	0
LOVING	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MADISON	1	18465	62.1	16713	53	33	0	35	0	19	191571	645	169754	540	349	1	371	0	0	1931	6	1627	5	0	0	1	0
MARTIN	0	0	0.0	0	0	0	0	0	0	0	4639	16	4110	13	8	0	9	0	0	0	0	0	0	0	0	0	0
MASON	0	0	0.0	0	0	0	0	0	0	3	28760	97	25484	81	52	0	56	0	0	0	0	0	0	0	0	0	0
MATAGORDA	5	82012	275.9	74230	236	148	0	155	0	32	331665	1116	293894	935	604	1	642	0	6	94757	319	79832	254	23	0	30	0
MAVERICK	17	297007	999.3	268827	855	535	1	563	0	54	555915	1870	492604	1567	1013	2	1077	1	15	256350	863	215973	687	61	0	80	0
MCCULLOCH	1	9575	32.2	8666	28	17	0	18	0	13	131103	441	116172	370	239	0	254	0	0	0	0	0	0	0	0	0	0
MCLENNAN	105	1872664	6300.8	1694982	5393	3372	5	3550	2	393	4071155	13698	3607512	11479	7417	11	7885	5	147	2439890	8209	2055588	6541	581	1	760	0
MCMULLEN	2	39019	131.3	35317	112	70	0	74	0	1	6494	22	5754	18	12	0	13	0	0	0	0	0	0	0	0	0	0
MEDINA	8	145451	489.4	131651	419	262	0	276	0	50	513018	1726	454593	1446	935	1	994	1	2	34649	117	29191	93	8	0	11	0
MENARD	0	6063	20.4	5488	17	11	0	11	0	1	12255	41	10859	35	22	0	24	0	0	0	0	0	0	0	0	0	0
MIDLAND	94	1671252	5623.1	1512680	4813	3009	5	3168	2	62	646748	2176	573093	1824	1178	2	1253	1	95	1570250	5283	1322923	4209	374	1	489	0
MILAM	3	48633	163.6	44019	140	88	0	92	0	39	401493	1351	355769	1132	731	1	778	0	10	163494	550	137743	438	39	0	51	0
MILLS	2	29303	98.6	26522	84	53	0	56	0	8	82901	279	73460	234	151	0	161	0	0	0	0	0	0	0	0	0	0
MITCHELL	4	64548	217.2	58424	186	116	0	122	0	0	1577	5	1397	4	3	0	3	0	0	3475	12	2928	9	1	0	1	0
MONTAGUE	1	22501	75.7	20366	65	41	0	43	0	13	130667	440	115786	368	238	0	253	0	10	162490	547	136897	436	39	0	51	0
Montgomery	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOTLEY	0	0	0.0	0	0	0	0	0	0	1	6587	22	5837	19	12	0	13	0	0	0	0	0	0	0	0	0	0
NACOGDOCHES	30	544114	1830.7	492488	1567	980	2	1031	1	165	1703274	5731	1509297	4802	3103	5	3299	2	27	442179	1488	372533	1185	105	0	138	0
NAVARRO	7	132548	446.0	119972	382	239	0	251	0	70	728317	2451	645373	2054	1327	2	1411	1	42	695261	2339	585752	1864	166	0	217	0
NOLAN	6	99496	334.8	90056	287	179	0	189	0	17	178115	599	157830	502	325	0	345	0	10	170522	574	143663	457	41	0	53	0
Nueces	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PALO PINTO	6	110980	373.4	100450	320	200	0	210	0	37	386626	1301	342595	1090	704	1	749	0	21	347692	1170	292928	932	83	0	108	0
Parker	13	238427	802.2	215805	687	429	1	452	0	182	1884766	6342	1670119	5314	3434	5	3651	2	99	1638128	5512	1380110	4391	390	1	510	0
PECOS	5	83248	280.1	75349	240	150	0	158	0	9	92217	310	81715	260	168	0	179	0	0	8149	27	6866	22	2	0	3	0
PRESIDIO	5	85271	286.9	77180	246	154	0	162	0	9	92774	312	82208	262	169	0	180	0	0	0	0	0	0	0	0	0	0
RAINS	2	29028	97.7	26274	84	52	0	55	0	21	222384	748	197057	627	405	1	431	0	0	0	0	0	0	0	0	0	0
REAGAN	1	15198	51.1	13756	44	27	0	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REAL	1	8055	27.1	7291	23	15	0	15	0	1	5937	20	5261	17	11	0	12	0	0	0	0	0	0	0	0	0	0
RED RIVER	3	58449	196.7	52903	168	105	0	111	0	27	283700	955	251391	800	517	1	549	0	0	2240	8	1887	6	1	0	1	0
REEVES	5	87301	293.7	79017	251	157	0	165	0	2	19946	67	17675	56	36	0	39	0	0	8149	27	6866	22	2	0	3	0
REFUGIO	2	32436	109.1	29358	93	58	0	61	0	1	13174	44	11674	37	24	0	26	0	0	0	0	0	0	0	0	0	0
ROBERTSON	2	34043	114.5	30813	98	61	0	65	0	4	46383	156	41101	131	85	0	90	0	0	0	0	0	0	0	0	0	0
Rockwall	34	608692	2048.0	550938	1753	1096	2	1154	1	203	2103845	7079	1864249	5932	3833	6	4075	3	123	2039263	6861	1718063	5467	485	1	635	0
RUNNELS	0	0	0.0	0	0	0	0	0	0	6	62344	210	55244	176	114	0	121	0	1	12743	43	10736	34	3	0	4	0
Rusk	1	20580	69.2	18627	59	37	0	39	0	12	126205	425	111832	356	230	0	244	0	21	355014	1194	299096	952	85	0	111	0
San Patricio	20	350543	1179.4	317283	1010	631	1	665	0	83	860943	2897	762895	2427	1569	2	1668	1	34	558687	1880	470689	1498	133	0	174	0
SAN SABA	4	76288	256.7	69050	220	137	0	145	0	3	27832	94	24662	78	51	0	54	0	1	12061	41	10161	32	3	0	4	0
SCHLEICHER	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCURRY	0	4823	16.2	4365	14	9	0	9	0	0	1299	4	1151	4	2	0	3	0	2	33594	113	28303	90	8	0	10	0
SHACKELFORD	2	32067	107.9	29025	92	58	0	61	0	4	40449	136	35843	114	74	0	78	0	0	0	0	0	0	0	0	0	0
Smith	114	2042049	6870.7	1848295	5881	3677	6	3871	2	163	1684625	5668	1492772	4750	3069	5	3263	2	125	2066730	6954	1741203	5540	492	1	644	0
SOMERVELL	0	5775	19.4	5227	17	10	0	11	0	9	89120	300	78971	251	162	0	173	0	0	3321	11	2798	9	1	0	1	0
STARR	9	168332	566.4	152361	485	303	0	319	0	172	1781748	5995	1578833	5024	3246	5	3451	2	3	52731	177	44425	141	13	0	16	0
STEPHENS	0	0	0.0	0	0	0	0	0	0	6	61962	208	54905	175	113	0	120	0	0	0	0	0	0	0	0	0	0
STERLING	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STONEWALL	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUTTON	0	0	0.0	0	0	0	0	0	0	7	68652	231	60834	194	125	0	133	0	0	0	0	0	0	0	0	0	0
Tarrant	1077	19244509	64750.7	17418547	55424	34651	53	36481	23	2284	23646868	79563	20953845	66673	43083	66	45801	28	2435	40397656	135923	34034707	108295	9617	15	12588	8
TAYLOR	51	908279	3056.0	822099	2616	1635	3	1722	1	74	766292	2578	679023	2161	1396	2	1484	1	120	1990129	6696	1676668	5335	474	1	620	0
TERRELL	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THROCKMORTON	1	18237	61.4	16507	53	33	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TITUS	16	292886	985.5	265097	844	527	1	555	0	97	1006452	3386	891833	2838	1834	3	1949	1	26	426245	1434	359108	1143	101	0	133	0
TOM GREEN	84	1496815	5036.2	1354794	4311	2695	4	2837	2	122	1260910	4242	1117312	3555	2297	4	2442	2	71	1180334	3971	994422	3164	281	0	368	0
Travis	534	9540320	32099.7	8635114	27476	17178	26	18085	11	890	9212446	30996	8163287	25975	16784	26	17843	11	1096	18177379	61160	15314298	48728	4327	7	5664	3
UPTON	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
UVALDE	12	209589	705.2	189702	604	377	1	397	0	27	284631	958	252216	803	519	1	551	0	28	464095	1562	390996	1244	110	0	145	0
VAL VERDE	18	327706	1102.6	296613	944	590	1	621	0	61	626938	2109	555539	1768	1142	2	1214	1	15	245453	826	206792	658	58	0	76	0
VAN ZANDT	3	53469	179.9	48395	154	96	0	101	0	84	872632	2936	773252	2460	1590	2	1690	1	0	5174	17	4359	14	1	0	2	0
Victoria	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waller	27	479012	1611.7	433562	1380	862	1	908	1	101	1042019	3506	923349	2938	1898	3	2018	1	4	70849	238	59690	190	17	0	22	0
WARD	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WASHINGTON	26	458868	1543.9	415329	1322	826	1	870	1	31	316914	1066	280823	894	577	1	614	0	28	470538	1583	396425	1261	112	0	147	0
WEBB	52	933357	3140.4	844798	2688	1681	3	1769	1	517	5353495	18013	4743812	15094	9754	15	10369	6	101	1668219	5613	1405462	4472	397	1	520	0
WHARTON	13	232441	782.1	210386	669	419	1	441	0	23	233412	785	206830	658	425	1	452	0	42	695986	2342	586363	1866	166	0	217	0
WICHITA	88	1576075	5302.9	1426533	4539	2838	4	2988	2	75	774464	2606	686264	2184	1411	2	1500	1	75	1252060	4213	1054851	3356	298	0	390	0
WILBARGER	3	54900	184.7	49691	158	99	0	104	0	7	71157	239	63054	201	130	0	138	0	9	143084	481	120547	384	34	0	45	0
WILLACY	2	29684	99.9	26868	85	53	0	56	0	37	383108	1289	339478	1080	698	1	742	0	23	388689	1308	327467	1042	93	0	121	0
Williamson	189	3384484	11387.5	3063357	9747	6094	9	6416	4	649	6718541	22605	5953400	18943	12241	19	13013	8	496	8234055	27705	6937126	22073	1960	3	2566	2
Wilson	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WINKLER	1	23405	78.7	21184	67	42	0	44	0	0	3525	12	3124	10	6	0	7	0	0	0	0	0	0	0	0	0	0
WISE	28	493940	1661.9	447074	1423	889	1	936	1	110	1137928	3829	1008335	3208	2073	3	2204	1	1	24290	82	20464	65	6	0	8	0
YOUNG	7	123279	414.8	111582	355	222	0	234	0	14	149883	504	132814	423	273	0	290	0	16	261816	881	220578	702	62	0	82	0
ZAPATA	2	39514	133.0	35765	114	71	0	75	0	40	417287	1404	369764	1177	760	1	808	0	1	13038	44	10985	35	3	0	4	0
ZAVALA	0	7599	25.6	6878	22	14	0	14	0	16	162789	548	144250	459	297	0	315	0	0	0	0	0	0	0	0	0	0
Total	7997	142929311	480904	129367862	411634	257351	396	270946	167	21378	221298093	744586	196095561	623954	403187	621	428627	265	14943	247923525	834171	208873617	664612	59023	91	77253	48

Table 60: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Food and Lodging Building Types (USDOE 2004) (Part 1).

Non-attainment Counties	**Food**									**Lodging**								
	In thousand sq.ft	**Electricity (kWh/yr), PNNL**				**Gas (mBtu/yr), PNNL**				**In thousand sq.ft**	**Electricity (kWh/yr), PNNL**				**Gas (mBtu/yr), PNNL**			
		1989 (Annual)	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**	**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**		**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**	**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**
Brazoria	87	2553080	8590	2582732	8218	3074	5	3021	2	78	974231	3278	934169	2972	1380	2	1250	1
Chambers	2	58965	198	59650	190	71	0	70	0	0	0	0	0	0	0	0	0	0
Collin	503	14849279	49962	15021741	47797	17879	28	17571	11	812	10090496	33951	9675560	30787	14298	22	12942	8
Dallas	597	17601964	59224	17806396	56658	21193	33	20829	13	1508	18735445	63038	17965016	57163	26548	41	24030	15
Denton	210	6187117	20817	6258975	19915	7449	11	7321	5	484	6018403	20250	5770917	18362	8528	13	7719	5
El Paso	101	2973724	10005	3008261	9572	3580	6	3519	2	330	4102708	13804	3933998	12518	5813	9	5262	3
Fort Bend	150	4429554	14904	4481000	14258	5333	8	5242	3	226	2806490	9443	2691083	8563	3977	6	3600	2
Galveston	79	2320583	7808	2347534	7470	2794	4	2746	2	181	2252660	7579	2160028	6873	3192	5	2889	2
Hardin	5	150048	505	151791	483	181	0	178	0	0	0	0	0	0	0	0	0	0
Harris	1019	30056916	101130	30406002	96748	36188	56	35567	22	2657	33018434	111095	31660666	100741	46786	72	42349	26
Jefferson	56	1656152	5572	1675387	5331	1994	3	1960	1	313	3884267	13069	3724541	11851	5504	8	4982	3
Liberty	4	107192	361	108437	345	129	0	127	0	6	72485	244	69505	221	103	0	93	0
Montgomery	154	4547540	15301	4600356	14638	5475	8	5381	3	277	3439739	11573	3298292	10495	4874	8	4412	3
Orange	4	113740	383	115061	366	137	0	135	0	16	197131	663	189025	601	279	0	253	0
Tarrant	650	19163326	64478	19385892	61684	23073	36	22676	14	1465	18204217	61250	17455632	55542	25795	40	23349	14
Waller	1	33609	113	33999	108	40	0	40	0	0	0	0	0	0	0	0	0	0
Total (Non-attainment)	3620	106802787	359352	108043213	343781	128590	198	126382	78	8352	103796706	349238	99528430	316688	147077	226	133130	82

Affected Counties	**Food**									**Lodging**								
	In thousand sq.ft	**Electricity (kWh/yr), PNNL**				**Gas (mBtu/yr), PNNL**				**In thousand sq.ft**	**Electricity (kWh/yr), PNNL**				**Gas (mBtu/yr), PNNL**			
		1989 (Annual)	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**	**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**		**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**	**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**
Bastrop	12	361909	1218	366113	1165	436	1	428	0	128	1588973	5346	1523632	4848	2252	3	2038	1
Bexar	476	14054629	47289	14217862	45240	16922	26	16631	10	1880	23367151	78622	22406258	71294	33111	51	29971	19
Caldwell	2	58332	196	59009	188	70	0	69	0	3	42332	142	40591	129	60	0	54	0
Comal	29	850197	2861	860072	2737	1024	2	1006	1	71	884643	2976	848265	2699	1254	2	1135	1
Ellis	31	925745	3115	936497	2980	1115	2	1095	1	40	499149	1679	478623	1523	707	1	640	0
Gregg	20	590677	1987	597537	1901	711	1	699	0	135	1671610	5624	1602871	5100	2369	4	2144	1
Guadalupe	24	699978	2355	708107	2253	843	1	828	1	48	602347	2027	577578	1838	854	1	773	0
Harrison	4	129557	436	131062	417	156	0	153	0	17	209998	707	201362	641	298	0	269	0
Hays	36	1076594	3622	1089098	3465	1296	2	1274	1	67	830557	2795	796403	2534	1177	2	1065	1
Henderson	6	163024	549	164917	525	196	0	193	0	5	64618	217	61960	197	92	0	83	0
Hood	3	100731	339	101901	324	121	0	119	0	6	80079	269	76786	244	113	0	103	0
Hunt	7	207306	698	209714	667	250	0	245	0	25	304599	1025	292073	929	432	1	391	0
Johnson	22	662507	2229	670202	2133	798	1	784	0	7	88094	296	84471	269	125	0	113	0
Kaufman	17	495419	1667	501173	1595	596	1	586	0	12	147757	497	141681	451	209	0	190	0
Nueces	27	807465	2717	816843	2599	972	1	955	1	237	2947851	9918	2826631	8994	4177	6	3781	2
Parker	26	777074	2615	786099	2501	936	1	920	1	52	646868	2176	620268	1974	917	1	830	1
Rockwall	33	967360	3255	978595	3114	1165	2	1145	1	20	245462	826	235368	749	348	1	315	0
Rusk	6	168407	567	170363	542	203	0	199	0	2	22179	75	21267	68	31	0	28	0
San Patricio	9	265023	892	268101	853	319	0	314	0	28	353933	1191	339378	1080	502	1	454	0
Smith	33	980389	3299	991775	3156	1180	2	1160	1	173	2145203	7218	2056989	6545	3040	5	2751	2
Travis	292	8622753	29012	8722900	27755	10382	16	10203	6	1107	13751995	46270	13186492	41958	19486	30	17638	11
Upshur	2	44401	149	44917	143	53	0	53	0	3	38007	128	36444	116	54	0	49	0
Victoria	14	402194	1353	406866	1295	484	1	476	0	35	428872	1443	411236	1309	608	1	550	0
Williamson	132	3905966	13142	3951331	12573	4703	7	4622	3	200	2481587	8350	2379540	7571	3516	5	3183	2
Wilson	3	82491	278	83449	266	99	0	98	0	22	267593	900	256589	816	379	1	343	0
Total (Affected)	1268	37400130	125838	37834501	120385	45030	69	44256	27	4322	53711455	180719	51502760	163876	76108	117	68890	43

Table 61: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Food and Lodging Building Types (USDOE 2004) (Part 2).

ERCOT Counties	Food									Lodging								
	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL				In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
ANDERSON	5	149976	505	151718	483	181	0	177	0	15	183609	618	176059	560	260	0	235	0
ANDREWS	0	0	0	0	0	0	0	0	0	8	100604	338	96467	307	143	0	129	0
ANGELINA	20	598763	2015	605717	1927	721	1	709	0	49	604607	2034	579745	1845	857	1	775	0
ARANSAS	9	273249	919	276423	880	329	1	323	0	9	108050	364	103606	330	153	0	139	0
ARCHER	0	0	0	0	0	0	0	0	0	3	32627	110	31286	100	46	0	42	0
ATASCOSA	5	153854	518	155641	495	185	0	182	0	15	189970	639	182159	580	269	0	244	0
AUSTIN	0	9214	31	9321	30	11	0	11	0	7	84997	286	81502	259	120	0	109	0
BANDERA	0	249	1	252	1	0	0	0	0	4	47601	160	45643	145	67	0	61	0
Bastrop	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BAYLOR	0	0	0	0	0	0	0	0	0	2	27034	91	25923	82	38	0	35	0
BEE	1	28795	97	29129	93	35	0	34	0	14	176135	593	168893	537	250	0	226	0
BELL	33	982264	3305	993672	3162	1183	2	1162	1	462	5747516	19338	5511169	17536	8144	13	7372	5
Bexar	476	14054629	47289	14217862	45240	16922	26	16631	10	1880	23367151	78622	22406258	71294	33111	51	29971	19
BLANCO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BORDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSQUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brazoria	87	2553080	8590	2582732	8218	3074	5	3021	2	78	974231	3278	934169	2972	1380	2	1250	1
BRAZOS	31	906467	3050	916995	2918	1091	2	1073	1	228	2827670	9514	2711392	8627	4007	6	3627	2
BREWSTER	0	0	0	0	0	0	0	0	0	6	73393	247	70375	224	104	0	94	0
BRISCOE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BROOKS	0	3737	13	3780	12	4	0	4	0	0	2026	7	1943	6	3	0	3	0
BROWN	3	95498	321	96608	307	115	0	113	0	19	240696	810	230798	734	341	1	309	0
BURLESON	0	4396	15	4447	14	5	0	5	0	3	33280	112	31911	102	47	0	43	0
BURNET	4	120277	405	121674	387	145	0	142	0	14	171182	576	164143	522	243	0	220	0
Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CALHOUN	5	136799	460	138388	440	165	0	162	0	1	12399	42	11889	38	18	0	16	0
CALLAHAN	0	1905	6	1927	6	2	0	2	0	0	0	0	0	0	0	0	0	0
CAMERON	72	2111850	7106	2136377	6798	2543	4	2499	2	342	4248638	14295	4073928	12963	6020	9	5449	3
Chambers	2	58965	198	59650	190	71	0	70	0	0	0	0	0	0	0	0	0	0
CHEROKEE	1	40374	136	40843	130	49	0	48	0	14	174027	586	166871	531	247	0	223	0
CHILDRESS	0	0	0	0	0	0	0	0	0	2	30151	101	28911	92	43	0	39	0
CLAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COKE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COLEMAN	0	2308	8	2335	7	3	0	3	0	1	17381	58	16666	53	25	0	22	0
Collin	503	14849279	49962	15021741	47797	17879	28	17571	11	812	10090496	33951	9675560	30787	14298	22	12942	8
COLORADO	0	3151	11	3187	10	4	0	4	0	7	82957	279	79546	253	118	0	106	0
Comal	29	850197	2861	860072	2737	1024	2	1006	1	71	884643	2976	848265	2699	1254	2	1135	1
COMANCHE	0	2088	7	2112	7	3	0	2	0	18	223037	750	213866	680	316	0	286	0
CONCHO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COOKE	6	189040	636	191235	608	228	0	224	0	32	394076	1326	377871	1202	558	1	505	0
CORYELL	5	151119	508	152875	486	182	0	179	0	17	205138	690	196702	626	291	0	263	0
COTTLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CROCKETT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CROSBY	0	0	0	0	0	0	0	0	0	2	21296	72	20420	65	30	0	27	0
CULBERSON	0	1465	5	1482	5	2	0	2	0	0	0	0	0	0	0	0	0	0
Dallas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAWSON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DE WITT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DELTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DICKENS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIMMIT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUVAL	0	6185	21	6257	20	7	0	7	0	0	1173	4	1125	4	2	0	2	0
EASTLAND	5	156016	525	157828	502	188	0	185	0	1	7677	26	7362	23	11	0	10	0
ECTOR	9	253940	854	256890	817	306	0	300	0	106	1318698	4437	1264471	4023	1869	3	1691	1
EDWARDS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ellis	31	925745	3115	936497	2980	1115	2	1095	1	40	499149	1679	478623	1523	707	1	640	0
ERATH	1	29816	100	30163	96	36	0	35	0	12	151147	509	144931	461	214	0	194	0
FALLS	0	3247	11	3285	10	4	0	4	0	0	0	0	0	0	0	0	0	0
FANNIN	1	42093	142	42582	135	51	0	50	0	7	84771	285	81285	259	120	0	109	0
FAYETTE	1	35316	119	35726	114	43	0	42	0	24	294066	989	281974	897	417	1	377	0
FISHER	0	0	0	0	0	0	0	0	0	2	24882	84	23859	76	35	0	32	0
FOARD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fort Bend	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRANKLIN	0	0	0	0	0	0	0	0	0	1	7831	26	7509	24	11	0	10	0
FREESTONE	0	0	0	0	0	0	0	0	0	1	6291	21	6032	19	9	0	8	0
FRIO	2	54585	184	55219	176	66	0	65	0	4	52568	177	50407	160	74	0	67	0
Galveston	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GILLESPIE	5	148702	500	150429	479	179	0	176	0	10	128298	432	123022	391	182	0	165	0
GLASSCOCK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLIAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GONZALES	1	20888	70	21131	67	25	0	25	0	5	59180	199	56746	181	84	0	76	0
GRAYSON	17	491273	1653	496978	1581	591	1	581	0	50	618467	2081	593035	1887	876	1	793	0
GRIMES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guadalupe	24	699978	2355	708107	2253	843	1	828	1	48	602347	2027	577578	1838	854	1	773	0
HALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HAMILTON	0	0	0	0	0	0	0	0	0	7	88768	299	85118	271	126	0	114	0
HARDEMAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harris	1019	30056916	101130	30406002	96748	36188	56	35567	22	2657	33018434	111095	31660666	100741	46786	72	42349	26
HASKELL	2	67770	228	68557	218	82	0	80	0	0	0	0	0	0	0	0	0	0
Hays	36	1076594	3622	1089098	3465	1296	2	1274	1	67	830557	2795	796403	2534	1177	2	1065	1
Henderson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HIDALGO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HILL	3	82174	276	83128	265	99	0	97	0	4	54734	184	52483	167	78	0	70	0
Hood	3	100731	339	101901	324	121	0	119	0	6	80079	269	76786	244	113	0	103	0
HOPKINS	4	120427	405	121826	388	145	0	143	0	8	101935	343	97743	311	144	0	131	0
HOUSTON	7	204531	688	206906	658	246	0	242	0	10	129711	436	124377	396	184	0	166	0
HOWARD	0	13814	46	13974	44	17	0	16	0	8	105578	355	101236	322	150	0	135	0
HUDSPETH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hunt	7	207306	698	209714	667	250	0	245	0	25	304599	1025	292073	929	432	1	391	0
IRION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JACKSON	0	6191	21	6263	20	7	0	7	0	0	0	0	0	0	0	0	0	0
JEFF DAVIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JIM HOGG	0	0	0	0	0	0	0	0	0	1	11310	38	10845	35	16	0	15	0

Table 62: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Food and Lodging Building Types (USDOE 2004) (Part 3).

ERCOT Counties	Food									Lodging								
	In thousand	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL				In thousand	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
	sq.ft	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	sq.ft	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
JIM WELLS	6	175148	589	177182	564	211	0	207	0	23	290815	978	278856	887	412	1	373	0
Johnson	22	662507	2229	670202	2133	798	1	784	0	7	88094	296	84471	269	125	0	113	0
JONES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KARNES	0	1282	4	1297	4	2	0	2	0	2	25591	86	24539	78	36	0	33	0
Kaufman	17	495419	1667	501173	1595	596	1	586	0	12	147757	497	141681	451	209	0	190	0
KENDALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENEDY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENT	0	0	0	0	0	0	0	0	0	2	29856	100	28629	91	42	0	38	0
KERR	6	177723	598	179787	572	214	0	210	0	53	660434	2222	633276	2015	936	1	847	1
KIMBLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KINNEY	0	3479	12	3519	11	4	0	4	0	0	0	0	0	0	0	0	0	0
KLEBERG	11	325516	1095	329297	1048	392	1	385	0	10	128816	433	123518	393	183	0	165	0
KNOX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LA SALLE	0	4726	16	4781	15	6	0	6	0	2	28049	94	26896	86	40	0	36	0
LAMAR	2	71574	241	72405	230	86	0	85	0	4	46823	158	44898	143	66	0	60	0
LAMPASAS	3	97015	326	98142	312	117	0	115	0	7	87055	293	83475	266	123	0	112	0
LAVACA	0	2381	8	2409	8	3	0	3	0	2	20686	70	19836	63	29	0	27	0
LEE	0	9046	30	9151	29	11	0	11	0	0	0	0	0	0	0	0	0	0
LEON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LIMESTONE	3	90907	306	91963	293	109	0	108	0	4	55128	185	52861	168	78	0	71	0
LIVE OAK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LLANO	0	0	0	0	0	0	0	0	0	47	589295	1983	565063	1798	835	1	756	0
LOVING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MADISON	0	916	3	927	3	1	0	1	0	0	0	0	0	0	0	0	0	0
MARTIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MASON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MATAGORDA	2	44950	151	45472	145	54	0	53	0	11	130703	440	125328	399	185	0	168	0
MAVERICK	4	121604	409	123016	391	146	0	144	0	37	462539	1556	443519	1411	655	1	593	0
MCCULLOCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MCLENNAN	39	1157404	3894	1170846	3725	1394	2	1370	1	180	2240581	7539	2148445	6836	3175	5	2874	2
MCMULLEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEDINA	1	16436	55	16627	53	20	0	19	0	0	2132	7	2045	7	3	0	3	0
MENARD	0	0	0	0	0	0	0	0	0	0	2879	10	2761	9	4	0	4	0
MIDLAND	25	744875	2506	753526	2398	897	1	881	1	54	670237	2255	642676	2045	950	1	860	1
MILAM	3	77556	261	78457	250	93	0	92	0	0	0	0	0	0	0	0	0	0
MILLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MITCHELL	0	1649	6	1668	5	2	0	2	0	5	63978	215	61347	195	91	0	82	0
MONTAGUE	3	77080	259	77975	248	93	0	91	0	6	75501	254	72397	230	107	0	97	0
Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOTLEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NACOGDOCHES	7	209755	706	212192	675	253	0	248	0	38	470506	1583	451158	1436	667	1	603	0
NAVARRO	11	329809	1110	333639	1062	397	1	390	0	32	401977	1353	385447	1226	570	1	516	0
NOLAN	3	80890	272	81829	260	97	0	96	0	8	98350	331	94306	300	139	0	126	0
Nueces	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PALO PINTO	6	164934	555	166849	531	199	0	195	0	4	46917	158	44988	143	66	0	60	0
Parker	26	777074	2615	786099	2501	936	1	920	1	52	646868	2176	620268	1974	917	1	830	1
PECOS	0	3866	13	3911	12	5	0	5	0	14	169768	571	162787	518	241	0	218	0
PRESIDIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RAINS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REAGAN	0	0	0	0	0	0	0	0	0	0	2666	9	2556	8	4	0	3	0
REAL	0	0	0	0	0	0	0	0	0	4	45267	152	43406	138	64	0	58	0
RED RIVER	0	1062	4	1075	3	1	0	1	0	0	0	0	0	0	0	0	0	0
REEVES	0	3866	13	3911	12	5	0	5	0	4	50132	169	48071	153	71	0	64	0
REFUGIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROBERTSON	0	0	0	0	0	0	0	0	0	2	24890	84	23867	76	35	0	32	0
Rockwall	33	967360	3255	978595	3114	1165	2	1145	1	20	245462	826	235368	749	348	1	315	0
RUNNELS	0	6045	20	6115	19	7	0	7	0	0	0	0	0	0	0	0	0	0
Rusk	6	168407	567	170363	542	203	0	199	0	2	22179	75	21267	68	31	0	28	0
San Patricio	9	265023	892	268101	853	319	0	314	0	28	353933	1191	339378	1080	502	1	454	0
SAN SABA	0	5721	19	5788	18	7	0	7	0	0	0	0	0	0	0	0	0	0
SCHLEICHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCURRY	1	15936	54	16121	51	19	0	19	0	1	14395	48	13803	44	20	0	18	0
SHACKELFORD	0	0	0	0	0	0	0	0	0	2	27679	93	26541	84	39	0	36	0
Smith	33	980389	3299	991775	3156	1180	2	1160	1	173	2145203	7218	2056989	6545	3040	5	2751	2
SOMERVELL	0	1575	5	1594	5	2	0	2	0	1	9490	32	9100	29	13	0	12	0
STARR	1	25014	84	25304	81	30	0	30	0	6	78989	266	75741	241	112	0	101	0
STEPHENS	0	0	0	0	0	0	0	0	0	1	14250	48	13664	43	20	0	18	0
STERLING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STONEWALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUTTON	0	0	0	0	0	0	0	0	0	5	56387	190	54068	172	80	0	72	0
Tarrant	650	19163326	64478	19385892	61684	23073	36	22676	14	1465	18204217	61250	17455632	55542	25795	40	23349	14
TAYLOR	32	944052	3176	955016	3039	1137	2	1117	1	90	1113210	3746	1067433	3396	1577	2	1428	1
TERRELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THROCKMORTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TITUS	7	202197	680	204545	651	243	0	239	0	0	4905	17	4703	15	7	0	6	0
TOM GREEN	19	559912	1884	566415	1802	674	1	663	0	154	1916183	6447	1837387	5846	2715	4	2458	2
Travis	292	8622753	29012	8722900	27755	10382	16	10203	6	1107	13751995	46270	13186492	41958	19486	30	17638	11
UPTON	0	0	0	0	0	0	0	0	0	1	6786	23	6507	21	10	0	9	0
UVALDE	7	220151	741	222708	709	265	0	261	0	4	51261	172	49153	156	73	0	66	0
VAL VERDE	4	116435	392	117787	375	140	0	138	0	18	221257	744	212159	675	314	0	284	0
VAN ZANDT	0	2455	8	2483	8	3	0	3	0	0	5331	18	5112	16	8	0	7	0
Victoria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waller	1	33609	113	33999	108	40	0	40	0	0	0	0	0	0	0	0	0	0
WARD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WASHINGTON	8	223208	751	225800	718	269	0	264	0	10	122016	411	116999	372	173	0	156	0
WEBB	27	791349	2663	800540	2547	953	1	936	1	179	2226134	7490	2134592	6792	3154	5	2855	2
WHARTON	11	330153	1111	333988	1063	398	1	391	0	9	112617	379	107986	344	160	0	144	0
WICHITA	20	593936	1998	600834	1912	715	1	703	0	247	3067365	10321	2941231	9359	4346	7	3934	2
WILBARGER	2	67874	228	68663	218	82	0	80	0	11	137552	463	131896	420	195	0	176	0
WILLACY	6	184381	620	186523	593	222	0	218	0	1	13968	47	13394	43	20	0	18	0
Williamson	132	3905966	13142	3951331	12573	4703	7	4622	3	200	2481587	8350	2379540	7571	3516	5	3183	2
Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WINKLER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WISE	0	11523	39	11656	37	14	0	14	0	71	888474	2989	851939	2711	1259	2	1140	1
YOUNG	4	124197	418	125640	400	150	0	147	0	4	53955	182	51736	165	76	0	69	0
ZAPATA	0	6185	21	6257	20	7	0	7	0	1	17192	58	16485	52	24	0	22	0
ZAVALA	0	0	0	0	0	0	0	0	0	4	51182	172	49078	156	73	0	66	0
Total	3986	117606806	395703	118972711	378558	141598	218	139167	86	11682	145178317	488471	139208368	442945	205714	317	186206	115

Table 63: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Office and Warehouse Building Types (USDOE 2004) (Part 1).

Non-attainment Counties	**Office**									**Warehouse**								
	In thousand sq.ft	**Electricity (kWh/yr), PNNL**				**Gas (mBtu/yr), PNNL**				**In thousand sq.ft**	**Electricity (kWh/yr), PNNL**				**Gas (mBtu/yr), PNNL**			
		1989 (Annual)	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**	**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**		**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**	**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**
Brazoria	95	1375942	4630	1229929	3913	533	1	601	0	158	477558	1607	820044	2609	1291	2	1437	1
Chambers	19	271457	913	242651	772	105	0	119	0	0	0	0	0	0	0	0	0	0
Collin	1139	16485583	55468	14736160	46889	6389	10	7198	4	817	2473333	8322	4247113	13514	6689	10	7440	5
Dallas	3522	50977389	171520	45567752	144991	19757	30	22257	14	5073	15363048	51691	26380842	83941	41545	64	46212	29
Denton	398	5762835	19390	5151292	16391	2233	3	2516	2	959	2903772	9770	4986248	15866	7853	12	8735	5
El Paso	508	7350661	24732	6570621	20907	2849	4	3209	2	1228	3720499	12518	6388700	20328	10061	15	11191	7
Fort Bend	429	6215725	20914	5556123	17679	2409	4	2714	2	599	1813684	6102	3114390	9910	4905	8	5456	3
Galveston	296	4284414	14415	3829759	12186	1660	3	1871	1	105	319174	1074	548073	1744	863	1	960	1
Hardin	2	27641	93	24708	79	11	0	12	0	0	0	0	0	0	0	0	0	0
Harris	3870	56022672	188496	50077639	159341	21712	33	24460	15	7754	23483006	79012	40324127	128307	63504	98	70637	44
Jefferson	131	1889093	6356	1688626	5373	732	1	825	1	61	183998	619	315954	1005	498	1	553	0
Liberty	16	233869	787	209052	665	91	0	102	0	2	7445	25	12784	41	20	0	22	0
Montgomery	454	6573447	22117	5875883	18696	2548	4	2870	2	290	876870	2950	1505728	4791	2371	4	2638	2
Orange	15	213303	718	190668	607	83	0	93	0	12	37144	125	63783	203	100	0	112	0
Tarrant	1317	19067840	64156	17044392	54233	7390	11	8325	5	2740	8297363	27918	14247916	45335	22438	35	24959	15
Waller	3	50225	169	44895	143	19	0	22	0	117	353143	1188	606403	1930	955	1	1062	1
Total (Non-attainment)	12214	176802097	594874	158040149	502866	68522	106	77194	48	19914	60310037	202921	103562105	329523	163093	251	181414	112

Affected Counties	**Office**									**Warehouse**								
	In thousand sq.ft	**Electricity (kWh/yr), PNNL**				**Gas (mBtu/yr), PNNL**				**In thousand sq.ft**	**Electricity (kWh/yr), PNNL**				**Gas (mBtu/yr), PNNL**			
		1989 (Annual)	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**	**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**		**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**	**1989 (Annual)**	**1989 (OSD)**	**1999 (Annual)**	**1999 (OSD)**
Bastrop	17	245925	827	219828	699	95	0	107	0	18	53432	180	91751	292	144	0	161	0
Bexar	1386	20058223	67489	17929678	57050	7774	12	8758	5	1414	4282781	14410	7354230	23400	11582	18	12883	8
Caldwell	1	13739	46	12281	39	5	0	6	0	7	20691	70	35530	113	56	0	62	0
Comal	78	1134374	3817	1013997	3226	440	1	495	0	42	127029	427	218130	694	344	1	382	0
Ellis	48	692436	2330	618955	1969	268	0	302	0	561	1700475	5721	2919991	9291	4599	7	5115	3
Gregg	43	615726	2072	550386	1751	239	0	269	0	71	215447	725	369957	1177	583	1	648	0
Guadalupe	84	1221421	4110	1091806	3474	473	1	533	0	183	553222	1861	949972	3023	1496	2	1664	1
Harrison	6	93904	316	83939	267	36	0	41	0	5	15462	52	26550	84	42	0	47	0
Hays	155	2241334	7541	2003488	6375	869	1	979	1	73	221823	746	380905	1212	600	1	667	0
Henderson	6	90860	306	81218	258	35	0	40	0	40	121778	410	209112	665	329	1	366	0
Hood	11	156073	525	139510	444	60	0	68	0	0	0	0	0	0	0	0	0	0
Hunt	33	478524	1610	427744	1361	185	0	209	0	20	60229	203	103423	329	163	0	181	0
Johnson	13	192568	648	172133	548	75	0	84	0	105	318118	1070	546260	1738	860	1	957	1
Kaufman	32	466828	1571	417289	1328	181	0	204	0	174	526734	1772	904488	2878	1424	2	1584	1
Nueces	178	2578033	8674	2304456	7333	999	2	1126	1	181	549080	1847	942859	3000	1485	2	1652	1
Parker	12	167639	564	149849	477	65	0	73	0	9	26871	90	46141	147	73	0	81	0
Rockwall	34	485745	1634	434198	1382	188	0	212	0	47	142326	479	244398	778	385	1	428	0
Rusk	5	68658	231	61372	195	27	0	30	0	5	14538	49	24963	79	39	0	44	0
San Patricio	111	1602526	5392	1432468	4558	621	1	700	0	355	1076527	3622	1848572	5882	2911	4	3238	2
Smith	174	2517025	8469	2249922	7159	976	2	1099	1	210	637079	2144	1093967	3481	1723	3	1916	1
Travis	894	12939141	43535	11566061	36802	5015	8	5649	3	675	2045175	6881	3511896	11174	5531	9	6152	4
Upshur	8	109384	368	97776	311	42	0	48	0	3	8569	29	14714	47	23	0	26	0
Victoria	30	432988	1457	387040	1232	168	0	189	0	17	51622	174	88644	282	140	0	155	0
Williamson	219	3162838	10642	2827203	8996	1226	2	1381	1	193	585487	1970	1005376	3199	1583	2	1761	1
Wilson	1	9075	31	8112	26	4	0	4	0	0	0	0	0	0	0	0	0	0
Total (Affected)	3577	51774987	174204	46280710	147260	20066	31	22606	14	4410	13354494	44933	22931830	72966	36114	56	40171	25

Table 64: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Office and Warehouse Building Types (USDOE 2004) (Part 2).

ERCOT Counties	Office									Warehouse								
	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL				In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
ANDERSON	15	213853	720	191159	608	83	0	93	0	11	31814	107	54629	174	86	0	96	0
ANDREWS	8	117176	394	104741	333	45	0	51	0	0	0	0	0	0	0	0	0	0
ANGELINA	49	704198	2369	629470	2003	273	0	307	0	11	34169	115	58673	187	92	0	103	0
ARANSAS	9	125847	423	112493	358	49	0	55	0	0	775	3	1330	4	2	0	2	0
ARCHER	3	38002	128	33969	108	15	0	17	0	1	4053	14	6959	22	11	0	12	0
ATASCOSA	15	221262	744	197782	629	86	0	97	0	4	10939	37	18784	60	30	0	33	0
AUSTIN	7	98997	333	88492	282	38	0	43	0	291	882126	2968	1514753	4820	2385	4	2653	2
BANDERA	4	55441	187	49558	158	21	0	24	0	0	0	0	0	0	0	0	0	0
Bastrop	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BAYLOR	2	31487	106	28146	90	12	0	14	0	0	0	0	0	0	0	0	0	0
BEE	14	205148	690	183378	583	80	0	90	0	0	443	1	760	2	1	0	1	0
BELL	462	6694244	22524	5983862	19040	2594	4	2923	2	167	506515	1704	869768	2768	1370	2	1524	1
Bexar	1880	27216179	91572	24328043	77409	10548	16	11883	7	1414	4282781	14410	7354230	23400	11582	18	12883	8
BLANCO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BORDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSQUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brazoria	78	1134706	3818	1014293	3227	440	1	495	0	158	477558	1607	820044	2609	1291	2	1437	1
BRAZOS	228	3293442	11081	2943948	9367	1276	2	1438	1	59	179130	603	307595	979	484	1	539	0
BREWSTER	6	85482	288	76411	243	33	0	37	0	6	17383	58	29849	95	47	0	52	0
BRISCOE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BROOKS	0	2360	8	2109	7	1	0	1	0	0	0	0	0	0	0	0	0	0
BROWN	19	280343	943	250594	797	109	0	122	0	10	29625	100	50872	162	80	0	89	0
BURLESON	3	38762	130	34648	110	15	0	17	0	0	0	0	0	0	0	0	0	0
BURNET	14	199379	671	178221	567	77	0	87	0	4	11058	37	18988	60	30	0	33	0
Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CALHOUN	1	14441	49	12908	41	6	0	6	0	0	547	2	939	3	1	0	2	0
CALLAHAN	0	0	0	0	0	0	0	0	0	1	3790	13	6508	21	10	0	11	0
CAMERON	342	4948472	16650	4423348	14075	1918	3	2161	1	475	1437879	4838	2469071	7856	3888	6	4325	3
Chambers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CHEROKEE	14	202693	682	181184	577	79	0	88	0	18	54160	182	93001	296	146	0	163	0
CHILDRESS	2	35117	118	31391	100	14	0	15	0	5	14192	48	24369	78	38	0	43	0
CLAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COKE	0	0	0	0	0	0	0	0	0	1	1715	6	2945	9	5	0	5	0
COLEMAN	1	20244	68	18095	58	8	0	9	0	0	0	0	0	0	0	0	0	0
Collin	812	11752599	39543	10505432	33427	4555	7	5131	3	817	2473333	8322	4247113	13514	6689	10	7440	5
COLORADO	7	96622	325	86368	275	37	0	42	0	0	636	2	1093	3	2	0	2	0
Comal	71	1030360	3467	921020	2931	399	1	450	0	42	127029	427	218130	694	344	1	382	0
COMANCHE	18	259776	874	232209	739	101	0	113	0	0	1190	4	2043	6	3	0	4	0
CONCHO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COOKE	32	458988	1544	410281	1305	178	0	200	0	9	28228	95	48472	154	76	0	85	0
CORYELL	17	238928	804	213573	680	93	0	104	0	7	21272	72	36528	116	58	0	64	0
COTTLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CROCKETT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CROSBY	2	24803	83	22171	71	10	0	11	0	0	0	0	0	0	0	0	0	0
CULBERSON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAWSON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DE WITT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DELTA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DICKENS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIMMIT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DUVAL	0	1366	5	1221	4	1	0	1	0	0	0	0	0	0	0	0	0	0
EASTLAND	1	8942	30	7993	25	3	0	4	0	0	0	0	0	0	0	0	0	0
ECTOR	106	1535913	5168	1372925	4368	595	1	671	0	185	560329	1885	962176	3062	1515	2	1685	1
EDWARDS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ellis	40	581368	1956	519675	1654	225	0	254	0	561	1700475	5721	2919991	9291	4599	7	5115	3
ERATH	12	176044	592	157362	501	68	0	77	0	3	7732	26	13278	42	21	0	23	0
FALLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FANNIN	7	98734	332	88257	281	38	0	43	0	8	23765	80	40808	130	64	0	71	0
FAYETTE	24	342505	1152	306159	974	133	0	150	0	1	2932	10	5035	16	8	0	9	0
FISHER	2	28981	98	25906	82	11	0	13	0	0	0	0	0	0	0	0	0	0
FOARD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fort Bend	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRANKLIN	1	9120	31	8153	26	4	0	4	0	106	320143	1077	549738	1749	866	1	963	1
FREESTONE	1	7327	25	6550	21	3	0	3	0	0	194	1	333	1	1	0	1	0
FRIO	4	61227	206	54730	174	24	0	27	0	0	0	0	0	0	0	0	0	0
Galveston	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GILLESPIE	10	149431	503	133574	425	58	0	65	0	8	23625	79	40568	129	64	0	71	0
GLASSCOCK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLIAD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GONZALES	5	68928	232	61613	196	27	0	30	0	0	0	0	0	0	0	0	0	0
GRAYSON	50	720341	2424	643900	2049	279	0	315	0	130	392624	1321	674200	2145	1062	2	1181	1
GRIMES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guadalupe	48	701566	2361	627117	1995	272	0	306	0	183	553222	1861	949972	3023	1496	2	1664	1
HALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HAMILTON	7	103390	348	92419	294	40	0	45	0	0	0	0	0	0	0	0	0	0
HARDEMAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harris	2657	38457218	129394	34376201	109381	14905	23	16791	10	7754	23483006	79012	40324127	128307	63504	98	70637	44
HASKELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hays	67	967366	3255	864711	2751	375	1	422	0	73	221823	746	380905	1212	600	1	667	0
Henderson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HIDALGO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HILL	4	63750	214	56985	181	25	0	28	0	0	0	0	0	0	0	0	0	0
Hood	6	93269	314	83372	265	36	0	41	0	0	0	0	0	0	0	0	0	0
HOPKINS	8	118725	399	106127	338	46	0	52	0	18	54510	183	93603	298	147	0	164	0
HOUSTON	10	151077	508	135045	430	59	0	66	0	0	912	3	1565	5	2	0	3	0
HOWARD	8	122968	414	109919	350	48	0	54	0	0	0	0	0	0	0	0	0	0
HUDSPETH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hunt	25	354772	1194	317124	1009	137	0	155	0	20	60229	203	103423	329	163	0	181	0
IRION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JACKSON	0	0	0	0	0	0	0	0	0	0	1245	4	2138	7	3	0	4	0
JEFF DAVIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JIM HOGG	1	13173	44	11775	37	5	0	6	0	0	0	0	0	0	0	0	0	0
JIM WELLS	23	338718	1140	302774	963	131	0	148	0	4	11704	39	20098	64	32	0	35	0

Table 65: Calculated ASHRAE Standard 90.1-1989 and 1999 Energy Use for Office and Warehouse Building Types (USDOE 2004) (Part 3).

ERCOT Counties	Office									Warehouse								
	In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL				In thousand sq.ft	Electricity (kWh/yr), PNNL				Gas (mBtu/yr), PNNL			
		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)		1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)	1989 (Annual)	1989 (OSD)	1999 (Annual)	1999 (OSD)
JIM WELLS	23	338718	1140	302774	963	131	0	148	0	4	11704	39	20098	64	32	0	35	0
Johnson	7	102605	345	91717	292	40	0	45	0	105	318118	1070	546260	1738	860	1	957	1
JONES	0	0	0	0	0	0	0	0	0	4	11506	39	19757	63	31	0	35	0
KARNES	2	29807	100	26644	85	12	0	13	0	0	0	0	0	0	0	0	0	0
Kaufman	12	172096	579	153833	489	67	0	75	0	174	526734	1772	904488	2878	1424	2	1584	1
KENDALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENEDY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENT	2	34774	117	31084	99	13	0	15	0	0	0	0	0	0	0	0	0	0
KERR	53	769221	2588	687592	2188	298	0	336	0	0	1162	4	1995	6	3	0	3	0
KIMBLE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KINNEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KLEBERG	10	150034	505	134113	427	58	0	66	0	1	3602	12	6186	20	10	0	11	0
KNOX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LA SALLE	2	32670	110	29203	93	13	0	14	0	0	0	0	0	0	0	0	0	0
LAMAR	4	54536	183	48748	155	21	0	24	0	3	8392	28	14410	46	23	0	25	0
LAMPASAS	7	101394	341	90635	288	39	0	44	0	0	0	0	0	0	0	0	0	0
LAVACA	2	24094	81	21537	69	9	0	11	0	0	0	0	0	0	0	0	0	0
LEE	0	0	0	0	0	0	0	0	0	1	1826	6	3135	10	5	0	5	0
LEON	0	0	0	0	0	0	0	0	0	0	166	1	285	1	0	0	0	0
LIMESTONE	4	64208	216	57395	183	25	0	28	0	1	1881	6	3230	10	5	0	6	0
LIVE OAK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LLANO	47	686364	2309	613528	1952	266	0	300	0	0	83	0	142	0	0	0	0	0
LOVING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MADISON	0	0	0	0	0	0	0	0	0	0	415	1	713	2	1	0	1	0
MARTIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MASON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MATAGORDA	11	152233	512	136078	433	59	0	66	0	8	25657	86	44056	140	69	0	77	0
MAVERICK	37	538729	1813	481560	1532	209	0	235	0	1	2149	7	3690	12	6	0	6	0
MCCULLOCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MCLENNAN	180	2609648	8781	2332717	7422	1011	2	1139	1	179	542819	1826	932109	2966	1468	2	1633	1
MCMULLEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEDINA	0	2484	8	2220	7	1	0	1	0	2	5105	17	8765	28	14	0	15	0
MENARD	0	3353	11	2997	10	1	0	1	0	0	0	0	0	0	0	0	0	0
MIDLAND	54	780638	2627	697798	2220	303	0	341	0	19	57731	194	99133	315	156	0	174	0
MILAM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MILLS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MITCHELL	5	74516	251	66609	212	29	0	33	0	0	0	0	0	0	0	0	0	0
MONTAGUE	6	87938	296	78606	250	34	0	38	0	1	2279	8	3914	12	6	0	7	0
Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOTLEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NACOGDOCHES	38	548008	1844	489854	1559	212	0	239	0	19	57119	192	98082	312	154	0	172	0
NAVARRO	32	468191	1575	418507	1332	181	0	204	0	80	242105	815	415734	1323	655	1	728	0
NOLAN	8	114550	385	102394	326	44	0	50	0	0	0	0	0	0	0	0	0	0
Nueces	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PALO PINTO	4	54645	184	48846	155	21	0	24	0	2	6614	22	11357	36	18	0	20	0
Parker	52	753420	2535	673469	2143	292	0	329	0	9	26871	90	46141	147	73	0	81	0
PECOS	14	197732	665	176749	562	77	0	86	0	0	0	0	0	0	0	0	0	0
PRESIDIO	0	0	0	0	0	0	0	0	0	1	1641	6	2818	9	4	0	5	0
RAINS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REAGAN	0	3105	10	2775	9	1	0	1	0	0	0	0	0	0	0	0	0	0
REAL	4	52724	177	47129	150	20	0	23	0	0	1217	4	2090	7	3	0	4	0
RED RIVER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
REEVES	4	58390	196	52194	166	23	0	25	0	0	0	0	0	0	0	0	0	0
REFUGIO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ROBERTSON	2	28990	98	25914	82	11	0	13	0	2	5339	18	9168	29	14	0	16	0
Rockwall	20	285895	962	255556	813	111	0	125	0	47	142326	479	244398	778	385	1	428	0
RUNNELS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rusk	2	25832	87	23091	73	10	0	11	0	5	14538	49	24963	79	39	0	44	0
San Patricio	28	412232	1387	368487	1172	160	0	180	0	355	1076527	3622	1848572	5882	2911	4	3238	2
SAN SABA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCHLEICHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCURRY	1	16766	56	14987	48	6	0	7	0	6	17705	60	30402	97	48	0	53	0
SHACKELFORD	2	32238	108	28817	92	12	0	14	0	0	0	0	0	0	0	0	0	0
Smith	173	2498560	8407	2233417	7106	968	1	1091	1	210	637079	2144	1093967	3481	1723	3	1916	1
SOMERVELL	1	11053	37	9880	31	4	0	5	0	1	3520	12	6044	19	10	0	11	0
STARR	6	92001	310	82238	262	36	0	40	0	0	0	0	0	0	0	0	0	0
STEPHENS	1	16597	56	14836	47	6	0	7	0	0	0	0	0	0	0	0	0	0
STERLING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STONEWALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUTTON	5	65675	221	58706	187	25	0	29	0	0	0	0	0	0	0	0	0	0
Tarrant	1465	21202809	71340	18952801	60306	8217	13	9257	6	2740	8297363	27918	14247916	45335	22438	35	24959	15
TAYLOR	90	1296577	4363	1158987	3688	503	1	566	0	78	235837	794	404971	1289	638	1	709	0
TERRELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THROCKMORTON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TITUS	0	5713	19	5107	16	2	0	2	0	0	0	0	0	0	0	0	0	0
TOM GREEN	154	2231816	7509	1994980	6348	865	1	974	1	45	136623	460	234603	746	369	1	411	0
Travis	1107	16017218	53892	14317498	45557	6208	10	6993	4	675	2045175	6881	3511896	11174	5531	9	6152	4
UPTON	1	7904	27	7065	22	3	0	3	0	0	0	0	0	0	0	0	0	0
UVALDE	4	59705	201	53369	170	23	0	26	0	7	20208	68	34700	110	55	0	61	0
VAL VERDE	18	257703	867	230356	733	100	0	113	0	7	20586	69	35349	112	56	0	62	0
VAN ZANDT	0	6210	21	5551	18	2	0	3	0	1	1787	6	3068	10	5	0	5	0
Victoria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waller	0	0	0	0	0	0	0	0	0	117	353143	1188	606403	1930	955	1	1062	1
WARD	0	0	0	0	0	0	0	0	0	1	1549	5	2660	8	4	0	5	0
WASHINGTON	10	142115	478	127034	404	55	0	62	0	21	64713	218	111122	354	175	0	195	0
WEBB	179	2592822	8724	2317676	7375	1005	2	1132	1	222	673100	2265	1155821	3678	1820	3	2025	1
WHARTON	9	131167	441	117248	373	51	0	57	0	16	48555	163	83378	265	131	0	146	0
WICHITA	247	3572620	12021	3193500	10161	1385	2	1560	1	42	126190	425	216688	689	341	1	380	0
WILBARGER	11	160210	539	143209	456	62	0	70	0	1	4339	15	7451	24	12	0	13	0
WILLACY	1	16269	55	14543	46	6	0	7	0	6	19185	65	32944	105	52	0	58	0
Williamson	200	2890353	9725	2583633	8221	1120	2	1262	1	193	585487	1970	1005376	3199	1583	2	1761	1
Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WINKLER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WISE	71	1034823	3482	925009	2943	401	1	452	0	0	255	1	438	1	1	0	1	0
YOUNG	4	62842	211	56173	179	24	0	27	0	1	3320	11	5700	18	9	0	10	0
ZAPATA	1	20023	67	17899	57	8	0	9	0	0	0	0	0	0	0	0	0	0
ZAVALA	4	59613	201	53287	170	23	0	26	0	1	2229	8	3828	12	6	0	7	0
Total	11682	169092036	568932	151148267	480936	65534	101	73828	46	17973	54432677	183146	93469727	297410	147199	227	163735	101

Table 66: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity and Natural Gas Savings (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). (Part 1)

Counties	Assembly		Education		Retail		Food		Lodging		Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
Non-attainment Counties																		
(square feet in thousands)																		
Brazoria	-217487	218	-589502	595	-847719	396	29652	-53	-40062	-131	-146013	67	342486	145	-1468644	1238	1571	-13243
Chambers	-16681	17	-57083	58	-19579	9	685	-1	0	0	-28807	13	0	0	-121464	96	130	-1023
Collin	-1299841	1303	-1915731	1934	-4930522	2302	172462	-307	-414936	-1356	-1749423	809	1773780	751	-8364211	5436	8950	-58161
Dallas	-2687509	2694	-3634352	3669	-5844518	2728	204432	-364	-770430	-2518	-5409637	2500	11017794	4667	-7124219	13377	7623	-143134
Denton	-702303	704	-1553507	1568	-2054357	959	71858	-128	-247486	-809	-611543	283	2082475	882	-3014861	3459	3226	-37015
El Paso	-550216	552	-968635	978	-987389	461	34537	-61	-168709	-551	-780040	361	2668201	1130	-752251	2868	805	-30690
Fort Bend	-442316	443	-796502	804	-1470780	687	51446	-92	-115407	-377	-659603	305	1300705	551	-2132456	2321	2282	-24836
Galveston	-242784	243	-395919	400	-770521	360	26952	-48	-92633	-303	-454655	210	228899	97	-1700661	959	1820	-10263
Hardin	-15359	15	-65367	66	-49822	23	1743	-3	0	0	-2933	1	0	0	-131738	103	141	-1101
Harris	-3906295	3916	-5626111	5679	-9980033	4659	349086	-621	-1357767	-4437	-5945034	2748	16841121	7134	-9625033	19077	10299	-204126
Jefferson	-190593	191	-176404	178	-549905	257	19235	-34	-159727	-522	-200467	93	131956	56	-1125905	218	1205	-2335
Liberty	-8325	8	-210238	212	-35592	17	1245	-2	-2981	-10	-24818	11	5339	2	-275369	239	295	-2557
Montgomery	-422239	423	-795633	803	-1509955	705	52816	-94	-141447	-462	-697563	322	628858	266	-2885165	1964	3087	-21013
Orange	-15543	16	-103800	105	-37766	18	1321	-2	-8106	-26	-22635	10	26639	11	-159891	131	171	-1401
Tarrant	-1825962	1831	-2693023	2718	-6362949	2970	222566	-396	-748585	-2446	-2023448	935	5950554	2521	-7480847	8133	8005	-87020
Waller	-45450	46	-118670	120	-11159	5	390	-1	0	0	-5330	2	253260	107	73042	280	-78	-2992
Total (Non-attainment)	-12588902	12620	-19700477	19886	-35462565	16555	1240426	-2208	-4268276	-13948	-18761948	8672	43252069	18321	-46289673	59898	49530	-640910
Affected Counties																		
(square feet in thousands)																		
Bastrop	-26304	26	-177180	179	-120168	56	4203	-7	-65341	-214	-26097	12	38319	16	-372567	69	399	-734
Bexar	-1411905	1415	-3284602	3316	-4666668	2179	163233	-291	-960892	-3140	-2128546	984	3071448	1301	-9217932	5764	9863	-61673
Caldwell	-2170	2	-42983	43	-19368	9	677	-1	-1741	-6	-1458	1	14839	6	-52204	55	56	-585
Comal	-64074	64	-258969	261	-282298	132	9874	-18	-36378	-119	-120378	56	91101	39	-661121	415	707	-4443
Ellis	-145626	146	-258008	260	-307382	143	10752	-19	-20526	-67	-73480	34	1219516	517	425246	1014	-455	-10852
Gregg	-136518	137	-66103	67	-196127	92	6860	-12	-68739	-225	-65340	30	154510	65	-371456	154	397	-1647
Guadalupe	-45489	46	-212901	215	-232419	109	8130	-14	-24769	-81	-129615	60	396750	168	-240314	502	257	-5367
Harrison	-34301	34	-36919	37	-43018	20	1505	-3	-8635	-28	-9965	5	11089	5	-120245	70	129	-751
Hays	-143360	144	-292001	295	-357470	167	12504	-22	-34154	-112	-237847	110	159083	67	-893244	649	956	-6942
Henderson	-16682	17	-57837	58	-54130	25	1893	-3	-2657	-9	-9642	4	87334	37	-51720	130	55	-1389
Hood	-59557	60	-75068	76	-33447	16	1170	-2	-3293	-11	-16562	8	0	0	-186756	146	200	-1561
Hunt	-52874	53	-178007	180	-68833	32	2408	-4	-12526	-41	-50780	23	43194	18	-317418	261	340	-2797
Johnson	-26320	26	-259715	262	-219977	103	7694	-14	-3623	-12	-20435	9	228142	97	-294233	472	315	-5048
Kaufman	-73736	74	-308323	311	-164498	77	5754	-10	-6076	-20	-49539	23	377754	160	-218664	615	234	-6578
Nueces	-252331	253	-259965	262	-268109	125	9378	-17	-121220	-396	-273577	126	393779	167	-772045	521	826	-5574
Parker	-22623	23	-214647	217	-258018	120	9025	-16	-26600	-87	-17790	8	19271	8	-511381	273	547	-2923
Rockwall	-57754	58	-239596	242	-321200	150	11235	-20	-10094	-33	-51546	24	102071	43	-566884	464	607	-4962
Rusk	-1953	2	-14373	15	-55917	26	1956	-3	-912	-3	-7286	3	10426	4	-68059	44	73	-470
San Patricio	-33260	33	-98049	99	-87998	41	3078	-5	-14554	-48	-170057	79	772045	327	371204	526	-397	-5628
Smith	-193754	194	-191854	194	-325526	152	11386	-20	-88214	-288	-267103	123	456889	194	-598175	548	640	-5867
Travis	-905207	907	-1049159	1059	-2863080	1337	100146	-178	-565503	-1848	-1373080	635	1466722	621	-5189162	2533	5552	-27101
Upshur	-27701	28	-51031	52	-14743	7	516	-1	-1563	-5	-11608	5	6145	3	-99985	88	107	-943
Victoria	-50299	50	-33261	34	-133544	62	4671	-8	-17636	-58	-45948	21	37022	16	-238995	117	256	-1255
Williamson	-321127	322	-765141	772	-1296928	605	45365	-81	-102047	-333	-335635	155	419889	178	-2355625	1618	2521	-17318
Wilson	-8555	9	-63549	64	-27390	13	958	-2	-11004	-36	-963	0	0	0	-110503	48	118	-517
Total (Affected)	-4113478	4124	-8489240	8569	-12418258	5797	434372	-773	-2208695	-7217	-5494276	2540	9577336	4057	-22712240	17096	24302	-182924

Table 67: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity and Natural Gas Savings (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). (Part 2)

Counties	Assembly		Education		Retail		Food		Lodging		Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
(square feet in thousands)																		
ANDERSON	-20002	20	-10872	11	-49798	23	1742	-3	-7550	-25	-22694	10	22816	10	-86358	47	92	-499
ANDREWS	-3063	3	-17908	18	0	0	0	0	-4137	-14	-12435	6	0	0	-37543	13	40	-143
ANGELINA	-94831	95	-104750	106	-198812	93	6954	-12	-24862	-81	-74728	35	24504	10	-466525	245	499	-2621
ARANSAS	-8872	9	-2166	2	-90729	42	3174	-6	-4443	-15	-13355	6	556	0	-115836	40	124	-425
ARCHER	-1348	1	-12974	13	0	0	0	0	-1342	-4	-4033	2	2907	1	-16790	13	18	-141
ATASCOSA	-33393	33	-42870	43	-51086	24	1787	-3	-7812	-26	-23480	11	7845	3	-149009	86	159	-921
AUSTIN	-1418	1	-66782	67	-3059	1	107	0	-3495	-11	-10505	5	632627	268	547474	331	-586	-3547
BANDERA	-2836	3	-47218	48	-83	0	3	0	-1957	-6	-5883	3	0	0	-57975	47	62	-501
Bastrop	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BAYLOR	0	0	-1543	2	0	0	0	0	-1112	-4	-3341	2	0	0	-5996	-1	6	6
BEE	-21542	22	-38414	39	-9561	4	334	-1	-7243	-24	-21770	10	317	0	-97879	51	105	-543
BELL	-187220	188	-430848	435	-326149	152	11408	-20	-236346	-772	-710382	328	363253	154	-1516284	464	1622	-4969
Bexar	-1411905	1415	-3284602	3316	-4666668	2179	163233	-291	-960892	-3140	-2888136	1335	3071448	1301	-9977522	6115	10676	-65429
BLANCO	-306	0	-26729	27	0	0	0	0	0	0	0	0	0	0	-27035	27	29	-292
BORDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSQUE	-1586	2	-19018	19	0	0	0	0	0	0	0	0	0	0	-20605	21	22	-222
Brazoria	-217487	218	-589502	595	-847719	396	29652	-53	-40062	-131	-120413	56	342486	145	-1443045	1226	1544	-13117
BRAZOS	-276636	277	-376350	380	-300981	141	10528	-19	-116278	-380	-349495	162	128465	54	-1280748	615	1370	-6580
BREWSTER	-7712	8	-13038	13	0	0	0	0	-3018	-10	-9071	4	12466	5	-20373	21	22	-219
BRISCOE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BROOKS	-303	0	0	0	-1241	1	43	0	-83	0	-250	0	0	0	-1834	1	2	-7
BROWN	-14487	15	-27406	28	-31709	15	1109	-2	-9898	-32	-29750	14	21246	9	-90894	45	97	-486
BURLESON	-2120	2	-15235	15	-1460	1	51	0	-1369	-4	-4113	2	0	0	-24246	16	26	-166
BURNET	-17307	17	-90754	92	-39936	19	1397	-2	-7039	-23	-21158	10	7930	3	-166867	115	179	-1233
Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CALHOUN	-72	0	-12442	13	-45423	21	1589	-3	-510	-2	-1532	1	392	0	-57998	30	62	-323
CALLAHAN	-4758	5	-20645	21	-633	0	22	0	0	0	0	0	2718	1	-23296	27	25	-289
CAMERON	-215844	216	-731527	738	-701214	327	24527	-44	-174710	-571	-525124	243	1031192	437	-1292699	1347	1383	-14414
Chambers	-16681	17	-57083	58	-19579	9	685	-1	0	0	0	0	0	0	-92658	82	99	-880
CHEROKEE	-32977	33	-35033	35	-13406	6	469	-1	-7156	-23	-21509	10	38841	16	-70771	77	76	-822
CHILDRESS	-7854	8	-3994	4	0	0	0	0	-1240	-4	-3727	2	10178	4	-6636	14	7	-149
CLAY	-952	1	-5852	6	0	0	0	0	0	0	0	0	0	0	-6803	7	7	-73
COKE	-5728	6	-3867	4	0	0	0	0	0	0	0	0	1230	1	-8365	10	9	-109
COLEMAN	-2966	3	-3485	4	-766	0	27	0	-715	-2	-2148	1	0	0	-10053	5	11	-58
Collin	-1299841	1303	-1915731	1934	-4930522	2302	172462	-307	-414936	-1356	-1247166	576	1773780	751	-7861954	5203	8412	-55677
COLORADO	0	0	-35520	36	-1046	0	37	0	-3411	-11	-10253	5	456	0	-49738	30	53	-322
Comal	-64074	64	-258969	261	-282298	132	9874	-18	-36378	-119	-109340	51	91101	39	-650083	410	696	-4388
COMANCHE	-2956	3	-10711	11	-693	0	24	0	-9172	-30	-27567	13	853	0	-50222	-3	54	30
CONCHO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COOKE	-17470	18	-43004	43	-62768	29	2196	-4	-16205	-53	-48707	23	20244	9	-165714	64	177	-690
CORYELL	-22234	22	-41293	42	-50177	23	1755	-3	-8436	-28	-25355	12	15256	6	-130484	75	140	-801
COTTLE	0	0	-1796	2	0	0	0	0	0	0	0	0	0	0	-1796	2	2	-19
CRANE	-2383	2	-1606	2	0	0	0	0	0	0	0	0	0	0	-3989	4	4	-43
CROCKETT	-5078	5	-1902	2	0	0	0	0	0	0	0	0	0	0	-6980	7	7	-75
CROSBY	-3027	3	-634	1	0	0	0	0	-876	-3	-2632	1	0	0	-7169	2	8	-22
CULBERSON	-577	1	-4909	5	-487	0	17	0	0	0	0	0	0	0	-5955	6	6	-61
Dallas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAWSON	-675	1	-7924	8	0	0	0	0	0	0	0	0	0	0	-8599	9	9	-93
DE WITT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DELTA	-1298	1	-10354	10	0	0	0	0	0	0	0	0	0	0	-11652	12	12	-126
Denton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DICKENS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIMMIT	0	0	-8628	9	0	0	0	0	0	0	0	0	0	0	-8628	9	9	-93
DUVAL	-361	0	-24087	24	-2054	1	72	0	-48	0	-145	0	0	0	-26622	25	28	-272
EASTLAND	-12110	12	-4438	4	-51803	24	1812	-3	-316	-1	-949	0	0	0	-67804	37	73	-396
ECTOR	-39883	40	-92180	93	-84318	39	2949	-5	-54227	-177	-162989	75	401847	170	-28800	235	31	-2520
EDWARDS	-260	0	-549	1	0	0	0	0	0	0	0	0	0	0	-809	1	1	-9
Ellis	-145626	146	-258008	260	-307382	143	10752	-19	-20526	-67	-61694	29	1219516	517	437032	1009	-468	-10794
ERATH	-11206	11	-57370	58	-9900	5	346	-1	-6215	-20	-18681	9	5545	2	-97481	64	104	-683
FALLS	-5670	6	-15193	15	-1078	1	38	0	0	0	0	0	0	0	-21903	21	23	-230
FANNIN	-16653	17	-41757	42	-13977	7	489	-1	-3486	-11	-10477	5	17043	7	-68818	65	74	-697
FAYETTE	-5605	6	-26063	26	-11726	5	410	-1	-12092	-40	-36346	17	2103	1	-89320	15	96	-159
FISHER	0	0	-4004	4	0	0	0	0	-1023	-3	-3075	1	0	0	-8103	2	9	-23
FOARD	-301	0	0	0	0	0	0	0	0	0	0	0	0	0	-301	0	0	-3
Fort Bend	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRANKLIN	-2629	3	0	0	0	0	0	0	-322	-1	-968	0	229594	97	225676	99	-241	-1062

Table 68: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity and Natural Gas Savings (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). (Part 3)

Counties	Assembly		Education		Retail		Food		Lodging		Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
FREESTONE	0	0	-35877	36	0	0	0	0	-259	-1	-778	0	139	0	-36774	36	39	-383
FRIO	-1554	2	-33609	34	-18124	8	634	-1	-2162	-7	-6497	3	0	0	-61312	39	66	-415
Galveston	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GILLESPIE	-19179	19	-9752	10	-49375	23	1727	-3	-5276	-17	-15857	7	16943	7	-80769	46	86	-496
GLASSCOCK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLIAD	0	0	-5151	5	0	0	0	0	0	0	0	0	0	0	-5151	5	6	-56
GONZALES	-2508	3	-13888	14	-6936	3	243	0	-2434	-8	-7314	3	0	0	-32837	15	35	-158
GRAYSON	-62045	62	-191137	193	-163121	76	5706	-10	-25432	-83	-76441	35	281575	119	-230896	393	247	-4201
GRIMES	-7795	8	-13887	14	0	0	0	0	0	0	0	0	0	0	-21682	22	23	-234
Guadalupe	-45489	46	-212901	215	-232419	109	8130	-14	-24769	-81	-74449	34	396750	168	-185148	476	198	-5094
HALL	0	0	-634	1	0	0	0	0	0	0	0	0	0	0	-634	1	1	-7
HAMILTON	-1154	1	-13767	14	0	0	0	0	-3650	-12	-10972	5	0	0	-29542	8	32	-88
HARDEMAN	-808	1	0	0	0	0	0	0	0	0	0	0	0	0	-808	1	1	-9
Harris	-3906295	3916	-5626111	5679	-9980033	4659	349086	-621	-1357767	-4437	-4081017	1886	16841121	7134	-7761016	18216	8304	-194907
HASKELL	-288	0	0	0	-22502	11	787	-1	0	0	0	0	0	0	-22004	9	24	-101
Hays	-143360	144	-292001	295	-357470	167	12504	-22	-34154	-112	-102655	47	159083	67	-758053	586	811	-6274
Henderson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HIDALGO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HILL	-10643	11	-87079	88	-27285	13	954	-2	-2251	-7	-6765	3	0	0	-133068	105	142	-1128
Hood	-59557	60	-75068	76	-33447	16	1170	-2	-3293	-11	-9898	5	0	0	-180092	143	193	-1528
HOPKINS	-12790	13	-29366	30	-39986	19	1399	-2	-4192	-14	-12599	6	39093	17	-58442	67	63	-720
HOUSTON	-4687	5	-9646	10	-67912	32	2375	-4	-5334	-17	-16032	7	654	0	-100583	32	108	-344
HOWARD	-11357	11	-19050	19	-4587	2	160	0	-4342	-14	-13049	6	0	0	-52223	24	56	-260
HUDSPETH	-1103	1	-10233	10	0	0	0	0	0	0	0	0	0	0	-11336	11	12	-122
Hunt	-52874	53	-178007	180	-68833	32	2408	-4	-12526	-41	-37648	17	43194	18	-304286	255	326	-2732
IRION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JACK	-2163	2	-1120	1	0	0	0	0	0	0	0	0	0	0	-3283	3	4	-35
JACKSON	-3131	3	-25766	26	-2056	1	72	0	0	0	0	0	893	0	-29988	30	32	-325
JEFF DAVIS	-10753	11	-169	0	0	0	0	0	0	0	0	0	0	0	-10922	11	12	-117
JIM HOGG	-726	1	-9743	10	0	0	0	0	-465	-2	-1398	1	0	0	-12333	10	13	-104
JIM WELLS	-375	0	-57567	58	-58156	27	2034	-4	-11959	-39	-35944	17	8394	4	-153573	63	164	-675
Johnson	-26320	26	-259715	262	-219977	103	7694	-14	-3623	-12	-10888	5	228142	97	-284687	467	305	-5001
JONES	-13723	14	-9954	10	0	0	0	0	0	0	0	0	8251	3	-15426	27	17	-292
KARNES	0	0	-11592	12	-426	0	15	0	-1052	-3	-3163	1	0	0	-16218	10	17	-106
Kaufman	-73736	74	-308323	311	-164498	77	5754	-10	-6076	-20	-18263	8	377754	160	-187387	600	201	-6423
KENDALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENEDY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENT	0	0	0	0	0	0	0	0	-1228	-4	-3690	2	0	0	-4918	-2	5	25
KERR	-72102	72	-58423	59	-59011	28	2064	-4	-27158	-89	-81628	38	833	0	-295425	104	316	-1118
KIMBLE	-2740	3	-317	0	0	0	0	0	0	0	0	0	0	0	-3057	3	3	-33
KING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KINNEY	0	0	-3625	4	-1155	1	40	0	0	0	0	0	0	0	-4740	4	5	-44
KLEBERG	-12623	13	-56936	57	-108084	50	3781	-7	-5297	-17	-15921	7	2584	1	-192497	105	206	-1123
KNOX	-1442	1	-1479	1	0	0	0	0	0	0	0	0	0	0	-2921	3	3	-31
LA SALLE	0	0	-2198	2	-1569	1	55	0	-1153	-4	-3467	2	0	0	-8332	1	9	-7
LAMAR	-12344	12	-60828	61	-23765	11	831	-1	-1925	-6	-5787	3	6018	3	-97801	82	105	-881
LAMPASAS	-3171	3	-11580	12	-32213	15	1127	-2	-3580	-12	-10760	5	0	0	-60176	21	64	-227
LAVACA	-25558	26	-5169	5	-791	0	28	0	-851	-3	-2557	1	0	0	-34897	30	37	-316
LEE	-1495	1	-19782	20	-3003	1	105	0	0	0	0	0	1309	1	-22866	23	24	-249
LEON	-11639	12	-7876	8	0	0	0	0	0	0	0	0	119	0	-19395	20	21	-210
LIMESTONE	-6113	6	-7890	8	-30185	14	1056	-2	-2267	-7	-6814	3	1349	1	-50863	23	54	-242
LIVE OAK	-5883	6	0	0	0	0	0	0	0	0	0	0	0	0	-5883	6	6	-63
LLANO	-843	1	-24068	24	0	0	0	0	-24233	-79	-72836	34	60	0	-121921	-20	130	218
LOVING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MADISON	-1752	2	-21817	22	-304	0	11	0	0	0	0	0	298	0	-23565	24	25	-257
MARTIN	0	0	-528	1	0	0	0	0	0	0	0	0	0	0	-528	1	1	-6
MASON	0	0	-3275	3	0	0	0	0	0	0	0	0	0	0	-3275	3	4	-35
MATAGORDA	-7781	8	-37772	38	-14925	7	522	-1	-5375	-18	-16155	7	18400	8	-63086	50	68	-531
MAVERICK	-28181	28	-63310	64	-40377	19	1412	-3	-19020	-62	-57169	26	1541	1	-205104	73	219	-786
MCCULLOCH	-908	1	-14931	15	0	0	0	0	0	0	0	0	0	0	-15839	16	17	-171
MCLENNAN	-177683	178	-463644	468	-384302	179	13442	-24	-92136	-301	-276932	128	389290	165	-991964	793	1061	-8490
MCMULLEN	-3702	4	-740	1	0	0	0	0	0	0	0	0	0	0	-4442	4	5	-48
MEDINA	-13801	14	-58425	59	-5457	3	191	0	-88	0	-264	0	3661	2	-74183	76	79	-818
MENARD	-575	1	-1396	1	0	0	0	0	-118	0	-356	0	0	0	-2445	2	3	-19
MIDLAND	-158572	159	-73655	74	-247327	115	8651	-15	-27561	-90	-82840	38	41402	18	-539901	299	578	-3201
MILAM	-4614	5	-45724	46	-25752	12	901	-2	0	0	0	0	0	0	-75189	61	80	-655
MILLS	-2780	3	-9441	10	0	0	0	0	0	0	0	0	0	0	-12222	12	13	-132
MITCHELL	-6124	6	-180	0	-547	0	19	0	-2631	-9	-7908	4	0	0	-17371	2	19	-17
MONTAGUE	-2135	2	-14881	15	-25593	12	895	-2	-3105	-10	-9332	4	1634	1	-52516	22	56	-239
Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOTLEY	0	0	-750	1	0	0	0	0	0	0	0	0	0	0	-750	1	1	-8

Table 69: Calculated ASHRAE Standard 90.1-1989 and 1999 Annual Electricity and Natural Gas Savings (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). (Part 4)

Counties	Assembly		Education		Retail		Food		Lodging		Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
NACOGDOCHES	-51627	52	-193977	196	-69647	33	2436	-4	-19348	-63	-58154	27	40963	17	-349353	257	374	-2747
NAVARRO	-12576	13	-82944	84	-109509	51	3830	-7	-16530	-54	-49684	23	173629	74	-93784	183	100	-1959
NOLAN	-9440	9	-20285	20	-26859	13	939	-2	-4044	-13	-12156	6	0	0	-71844	33	77	-355
Nueces	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PALO PINTO	-10530	11	-44031	44	-54764	26	1916	-3	-1929	-6	-5799	3	4743	2	-110395	76	118	-808
Parker	-22623	23	-214647	217	-258018	120	9025	-16	-26600	-87	-79952	37	19271	8	-573543	302	614	-3231
PECOS	-7899	8	-10502	11	-1284	1	45	0	-6981	-23	-20983	10	0	0	-47604	6	51	-63
PRESIDIO	-8091	8	-10566	11	0	0	0	0	0	0	0	0	1177	0	-17479	19	19	-206
RAINS	-2754	3	-25326	26	0	0	0	0	0	0	0	0	0	0	-28080	28	30	-303
REAGAN	-1442	1	0	0	0	0	0	0	-110	0	-329	0	0	0	-1881	1	2	-13
REAL	-764	1	-676	1	0	0	0	0	-1861	-6	-5595	3	873	0	-8024	-2	9	18
RED RIVER	-5546	6	-32309	33	-353	0	12	0	0	0	0	0	0	0	-38195	38	41	-410
REEVES	-8283	8	-2272	2	-1284	1	45	0	-2062	-7	-6196	3	0	0	-20051	7	21	-78
REFUGIO	-3078	3	-1500	2	0	0	0	0	0	0	0	0	0	0	-4578	5	5	-49
ROBERTSON	-3230	3	-5282	5	0	0	0	0	-1024	-3	-3076	1	3829	2	-8783	8	9	-88
Rockwall	-57754	58	-239596	242	-321200	150	11235	-20	-10094	-33	-30339	14	102071	43	-545677	454	584	-4857
RUNNELS	0	0	-7100	7	-2007	1	70	0	0	0	0	0	0	0	-9037	8	10	-85
Rusk	-1953	2	-14373	15	-55917	26	1956	-3	-912	-3	-2741	1	10426	4	-63515	42	68	-447
San Patricio	-33260	33	-98049	99	-87998	41	3078	-5	-14554	-48	-43745	20	772045	327	497516	468	-532	-5003
SAN SABA	-7238	7	-3170	3	-1900	1	66	0	0	0	0	0	0	0	-12241	11	13	-120
SCHLEICHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCURRY	-458	0	-148	0	-5291	2	185	0	-592	-2	-1779	1	12697	5	4614	7	-5	-75
SHACKELFORD	-3043	3	-4607	5	0	0	0	0	-1138	-4	-3421	2	0	0	-12208	6	13	-60
Smith	-193754	194	-191854	194	-325526	152	11386	-20	-88214	-288	-265143	123	456889	194	-596216	547	638	-5857
SOMERVELL	-548	1	-10149	10	-523	0	18	0	-390	-1	-1173	1	2524	1	-10241	11	11	-121
STARR	-15972	16	-202914	205	-8305	4	291	-1	-3248	-11	-9763	5	0	0	-239912	218	257	-2334
STEPHENS	0	0	-7057	7	0	0	0	0	-586	-2	-1761	1	0	0	-9404	6	10	-64
STERLING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STONEWALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUTTON	0	0	-7818	8	0	0	0	0	-2319	-8	-6969	3	0	0	-17107	4	18	-38
Tarrant	-1825962	1831	-2693023	2718	-6362949	2970	222566	-396	-748585	-2446	-2250007	1040	5950554	2521	-7707406	8237	8247	-88140
TAYLOR	-86180	86	-87269	88	-313461	146	10964	-20	-45777	-150	-137591	64	169134	72	-490179	287	524	-3070
TERRELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THROCKMORTON	-1730	2	0	0	0	0	0	0	0	0	0	0	0	0	-1730	2	2	-19
TITUS	-27790	28	-114620	116	-67137	31	2348	-4	-202	-1	-606	0	0	0	-208006	170	223	-1823
TOM GREEN	-142021	142	-143599	145	-185912	87	6503	-12	-78796	-257	-236837	109	97981	42	-682681	256	730	-2739
Travis	-905207	907	-1049159	1059	-2863080	1337	100146	-178	-565503	-1848	-1699721	786	1466722	621	-5515802	2684	5902	-28716
UPTON	0	0	0	0	0	0	0	0	-279	-1	-839	0	0	0	-1118	-1	1	6
UVALDE	-19886	20	-32415	33	-73099	34	2557	-5	-2108	-7	-6336	3	14492	6	-116795	84	125	-903
VAL VERDE	-31093	31	-71399	72	-38661	18	1352	-2	-9098	-30	-27347	13	14763	6	-161483	108	173	-1156
VAN ZANDT	-5073	5	-99380	100	-815	0	29	0	-219	-1	-659	0	1281	1	-104836	106	112	-1133
Victoria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waller	-45450	46	-118670	120	-11159	5	390	-1	0	0	0	0	253260	107	78371	277	-84	-2965
WARD	0	0	0	0	0	0	0	0	0	0	0	0	1111	0	1111	0	-1	-5
WASHINGTON	-43538	44	-36092	36	-74114	35	2592	-5	-5017	-16	-15081	7	46410	20	-124840	120	134	-1287
WEBB	-88559	89	-609683	615	-262758	123	9191	-16	-91542	-299	-275146	127	482722	204	-835775	843	894	-9020
WHARTON	-22054	22	-26582	27	-109623	51	3834	-7	-4631	-15	-13919	6	34822	15	-138154	99	148	-1063
WICHITA	-149541	150	-88200	89	-197209	92	6898	-12	-126135	-412	-379121	175	90498	38	-842809	120	902	-1285
WILBARGER	-5209	5	-8104	8	-22537	11	788	-1	-5656	-18	-17001	8	3112	1	-54607	13	58	-141
WILLACY	-2816	3	-43630	44	-61222	29	2141	-4	-574	-2	-1726	1	13759	6	-94069	76	101	-817
Williamson	-321127	322	-765141	772	-1296928	605	45365	-81	-102047	-333	-306719	142	419889	178	-2326709	1605	2490	-17175
Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WINKLER	-2221	2	-401	0	0	0	0	0	0	0	0	0	0	0	-2622	3	3	-28
WISE	-46866	47	-129593	131	-3826	2	134	0	-36535	-119	-109814	51	183	0	-326317	111	349	-1185
YOUNG	-11697	12	-17069	17	-41238	19	1442	-3	-2219	-7	-6669	3	2381	1	-75069	42	80	-455
ZAPATA	-3749	4	-47523	48	-2054	1	72	0	-707	-2	-2125	1	0	0	-56086	51	60	-548
ZAVALA	-721	1	-18539	19	0	0	0	0	-2105	-7	-6326	3	1599	1	-26092	16	28	-173
Total	-13561449	13595	-25202532	25440	-39049908	18230	1365906	-2432	-5969950	-19508	-17943769	8294	39037049	16535	-61324651	60154	65617	-643648

Table 70: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity and Natural Gas Savings (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). (Part 1)

Counties	Assembly		Education		Retail		Food		Lodging		Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
Non-attainment Counties																		
(square feet in thousands)																		
Brazoria	-1111	-4	-2822	-8	-3681	-1	-372	-3	-306	-1	-716	0	1002	-1	-8005	-19	9	200
Chambers	-85	0	-273	-1	-85	0	-9	0	0	0	-141	0	0	0	-593	-1	1	14
Collin	-6639	-22	-9170	-27	-21409	-5	-2165	-17	-3164	-14	-8579	-5	5192	-6	-45934	-96	49	1030
Dallas	-13728	-45	-17396	-51	-25378	-6	-2566	-20	-5875	-26	-26529	-17	32250	-35	-59221	-201	63	2151
Denton	-3587	-12	-7436	-22	-8920	-2	-902	-7	-1887	-8	-2999	-2	6096	-7	-19636	-60	21	642
El Paso	-2810	-9	-4636	-14	-4287	-1	-434	-3	-1287	-6	-3825	-2	7810	-9	-9470	-44	10	472
Fort Bend	-2259	-7	-3812	-11	-6386	-2	-646	-5	-880	-4	-3235	-2	3807	-4	-13411	-35	14	379
Galveston	-1240	-4	-1895	-6	-3346	-1	-338	-3	-706	-3	-2230	-1	670	-1	-9085	-18	10	197
Hardin	-78	0	-313	-1	-216	0	-22	0	0	0	-14	0	0	0	-644	-1	1	15
Harris	-19953	-66	-26930	-79	-43334	-11	-4382	-34	-10354	-46	-29154	-18	49295	-54	-84812	-309	91	3301
Jefferson	-974	-3	-844	-2	-2388	-1	-241	-2	-1218	-5	-983	-1	386	0	-6262	-15	7	156
Liberty	-43	0	-1006	-3	-155	0	-16	0	-23	0	-122	0	16	0	-1348	-3	1	37
Montgomery	-2157	-7	-3808	-11	-6556	-2	-663	-5	-1079	-5	-3421	-2	1841	-2	-15843	-34	17	365
Orange	-79	0	-497	-1	-164	0	-17	0	-62	0	-111	0	78	0	-852	-2	1	25
Tarrant	-9327	-31	-12890	-38	-27629	-7	-2794	-22	-5709	-25	-9923	-6	17418	-19	-50853	-148	54	1584
Waller	-232	-1	-568	-2	-48	0	-5	0	0	0	-26	0	741	-1	-138	-3	0	36
Total (Non-attainment)	-64303	-212	-94297	-278	-153982	-39	-15571	-120	-32549	-144	-92008	-58	126602	-139	-326109	-991	349	10604

Affected Counties																		
(square feet in thousands)																		
Bastrop	-134	0	-848	-3	-522	0	-53	0	-498	-2	-128	0	112	0	-2071	-6	2	63
Bexar	-7212	-24	-15722	-46	-20263	-5	-2049	-16	-7328	-32	-10438	-7	8990	-10	-54022	-140	58	1499
Caldwell	-11	0	-206	-1	-84	0	-9	0	-13	0	-7	0	43	0	-286	-1	0	9
Comal	-327	-1	-1240	-4	-1226	0	-124	-1	-277	-1	-590	0	267	0	-3518	-8	4	85
Ellis	-744	-2	-1235	-4	-1335	0	-135	-1	-157	-1	-360	0	3570	-4	-396	-12	0	132
Gregg	-697	-2	-316	-1	-852	0	-86	-1	-524	-2	-320	0	452	0	-2344	-7	3	76
Guadalupe	-232	-1	-1019	-3	-1009	0	-102	-1	-189	-1	-636	0	1161	-1	-2026	-7	2	78
Harrison	-175	-1	-177	-1	-187	0	-19	0	-66	0	-49	0	32	0	-640	-2	1	18
Hays	-732	-2	-1398	-4	-1552	0	-157	-1	-260	-1	-1166	-1	466	-1	-4800	-11	5	113
Henderson	-85	0	-277	-1	-235	0	-24	0	-20	0	-47	0	256	0	-433	-2	0	19
Hood	-304	-1	-359	-1	-145	0	-15	0	-25	0	-81	0	0	0	-930	-2	1	25
Hunt	-270	-1	-852	-3	-299	0	-30	0	-96	0	-249	0	126	0	-1669	-4	2	47
Johnson	-134	0	-1243	-4	-955	0	-97	-1	-28	0	-100	0	668	-1	-1889	-6	2	64
Kaufman	-377	-1	-1476	-4	-714	0	-72	-1	-46	0	-243	0	1106	-1	-1822	-8	2	85
Nueces	-1289	-4	-1244	-4	-1164	0	-118	-1	-924	-4	-1342	-1	1153	-1	-4929	-15	5	164
Parker	-116	0	-1027	-3	-1120	0	-113	-1	-203	-1	-87	0	56	0	-2610	-6	3	60
Rockwall	-295	-1	-1147	-3	-1395	0	-141	-1	-77	0	-253	0	299	0	-3009	-7	3	71
Rusk	-10	0	-69	0	-243	0	-25	0	-7	0	-36	0	31	0	-358	-1	0	6
San Patricio	-170	-1	-469	-1	-382	0	-39	0	-111	0	-834	-1	2260	-2	255	-6	0	62
Smith	-990	-3	-918	-3	-1413	0	-143	-1	-673	-3	-1310	-1	1337	-1	-4110	-13	4	136
Travis	-4624	-15	-5022	-15	-12432	-3	-1257	-10	-4312	-19	-6734	-4	4293	-5	-30087	-71	32	760
Upshur	-141	0	-244	-1	-64	0	-6	0	-12	0	-57	0	18	0	-507	-1	1	15
Victoria	-257	-1	-159	0	-580	0	-59	0	-134	-1	-225	0	108	0	-1306	-3	1	30
Williamson	-1640	-5	-3662	-11	-5631	-1	-569	-4	-778	-3	-1646	-1	1229	-1	-12699	-28	14	298
Wilson	-44	0	-304	-1	-119	0	-12	0	-84	0	-5	0	0	0	-567	-2	1	16
Total (Affected)	-21011	-69	-40634	-120	-53921	-14	-5453	-42	-16843	-75	-26944	-17	28034	-31	-136773	-367	146	3931

Table 71: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity and Natural Gas Savings (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). (Part 2)

Counties	Assembly		Education		Retail		Food		Lodging		Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
(square feet in thousands)																		
ANDERSON	-102	0	-52	0	-216	0	-22	0	-58	0	-111	0	67	0	-494	-1	1	12
ANDREWS	-16	0	-86	0	0	0	0	0	-32	0	-61	0	0	0	-194	0	0	5
ANGELINA	-484	-2	-501	-1	-863	0	-87	-1	-190	-1	-366	0	72	0	-2421	-5	3	55
ARANSAS	-45	0	-10	0	-394	0	-40	0	-34	0	-65	0	2	0	-587	-1	1	8
ARCHER	-7	0	-62	0	0	0	0	0	-10	0	-20	0	9	0	-90	0	0	3
ATASCOSA	-171	-1	-205	-1	-222	0	-22	0	-60	0	-115	0	23	0	-772	-2	1	19
AUSTIN	-7	0	-320	-1	-13	0	-1	0	-27	0	-52	0	1852	-2	1432	-3	-2	34
BANDERA	-14	0	-226	-1	0	0	0	0	-15	0	-29	0	0	0	-285	-1	0	9
Bastrop	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BAYLOR	0	0	-7	0	0	0	0	0	-8	0	-16	0	0	0	-32	0	0	1
BEE	-110	0	-184	-1	-42	0	-4	0	-55	0	-107	0	1	0	-501	-1	1	14
BELL	-956	-3	-2062	-6	-1416	0	-143	-1	-1802	-8	-3484	-2	1063	-1	-8801	-22	9	236
Bexar	-7212	-24	-15722	-46	-20263	-5	-2049	-16	-7328	-32	-14163	-9	8990	-10	-57747	-142	62	1524
BLANCO	-2	0	-128	0	0	0	0	0	0	0	0	0	0	0	-130	0	0	4
BORDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BOSQUE	-8	0	-91	0	0	0	0	0	0	0	0	0	0	0	-99	0	0	3
Brazoria	-1111	-4	-2822	-8	-3681	-1	-372	-3	-306	-1	-591	0	1002	-1	-7879	-19	8	199
BRAZOS	-1413	-5	-1801	-5	-1307	0	-132	-1	-887	-4	-1714	-1	376	0	-6878	-17	7	179
BREWSTER	-39	0	-62	0	0	0	0	0	-23	0	-44	0	36	0	-133	0	0	5
BRISCOE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BROOKS	-2	0	0	0	-5	0	-1	0	-1	0	-1	0	0	0	-9	0	0	0
BROWN	-74	0	-131	0	-138	0	-14	0	-75	0	-146	0	62	0	-516	-1	1	14
BURLESON	-11	0	-73	0	-6	0	-1	0	-10	0	-20	0	0	0	-121	0	0	3
BURNET	-88	0	-434	-1	-173	0	-18	0	-54	0	-104	0	23	0	-848	-2	1	22
Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CALHOUN	0	0	-60	0	-197	0	-20	0	-4	0	-8	0	1	0	-287	0	0	4
CALLAHAN	-24	0	-99	0	-3	0	0	0	0	0	0	0	8	0	-118	0	0	4
CAMERON	-1103	-4	-3501	-10	-3045	-1	-308	-2	-1332	-6	-2575	-2	3018	-3	-8846	-28	9	299
Chambers	-85	0	-273	-1	-85	0	-9	0	0	0	0	0	0	0	-452	-1	0	13
CHEROKEE	-168	-1	-168	0	-58	0	-6	0	-55	0	-105	0	114	0	-447	-2	0	17
CHILDRESS	-40	0	-19	0	0	0	0	0	-9	0	-18	0	30	0	-57	0	0	3
CLAY	-5	0	-28	0	0	0	0	0	0	0	0	0	0	0	-33	0	0	1
COKE	-29	0	-19	0	0	0	0	0	0	0	0	0	4	0	-44	0	0	2
COLEMAN	-15	0	-17	0	-3	0	0	0	-5	0	-11	0	0	0	-51	0	0	1
Collin	-6639	-22	-9170	-27	-21409	-5	-2165	-17	-3164	-14	-6116	-4	5192	-6	-43471	-95	47	1013
COLORADO	0	0	-170	-1	-5	0	0	0	-26	0	-50	0	1	0	-250	-1	0	7
Comal	-327	-1	-1240	-4	-1226	0	-124	-1	-277	-1	-536	0	267	0	-3464	-8	4	84
COMANCHE	-15	0	-51	0	-3	0	0	0	-70	0	-135	0	2	0	-272	-1	0	6
CONCHO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COOKE	-89	0	-206	-1	-273	0	-28	0	-124	-1	-239	0	59	0	-898	-2	1	21
CORYELL	-114	0	-198	-1	-218	0	-22	0	-64	0	-124	0	45	0	-695	-2	1	17
COTTLE	0	0	-9	0	0	0	0	0	0	0	0	0	0	0	-9	0	0	0
CRANE	-12	0	-8	0	0	0	0	0	0	0	0	0	0	0	-20	0	0	1
CROCKETT	-26	0	-9	0	0	0	0	0	0	0	0	0	0	0	-35	0	0	1
CROSBY	-15	0	-3	0	0	0	0	0	-7	0	-13	0	0	0	-38	0	0	1
CULBERSON	-3	0	-23	0	-2	0	0	0	0	0	0	0	0	0	-29	0	0	1
Dallas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DAWSON	-3	0	-38	0	0	0	0	0	0	0	0	0	0	0	-41	0	0	1
DE WITT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DELTA	-7	0	-50	0	0	0	0	0	0	0	0	0	0	0	-56	0	0	2
Denton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DICKENS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIMMIT	0	0	-41	0	0	0	0	0	0	0	0	0	0	0	-41	0	0	1
DUVAL	-2	0	-115	0	-9	0	-1	0	0	0	-1	0	0	0	-128	0	0	4
EASTLAND	-62	0	-21	0	-225	0	-23	0	-2	0	-5	0	0	0	-338	-1	0	5
ECTOR	-204	-1	-441	-1	-366	0	-37	0	-414	-2	-799	-1	1176	-1	-1085	-6	1	64
EDWARDS	-1	0	-3	0	0	0	0	0	0	0	0	0	0	0	-4	0	0	0
Ellis	-744	-2	-1235	-4	-1335	0	-135	-1	-157	-1	-303	0	3570	-4	-338	-12	0	131
ERATH	-57	0	-275	-1	-43	0	-4	0	-47	0	-92	0	16	0	-502	-1	1	14
FALLS	-29	0	-73	0	-5	0	0	0	0	0	0	0	0	0	-107	0	0	3
FANNIN	-85	0	-200	-1	-61	0	-6	0	-27	0	-51	0	50	0	-380	-1	0	12
FAYETTE	-29	0	-125	0	-51	0	-5	0	-92	0	-178	0	6	0	-474	-1	1	11
FISHER	0	0	-19	0	0	0	0	0	-8	0	-15	0	0	0	-42	0	0	1
FOARD	-2	0	0	0	0	0	0	0	0	0	0	0	0	0	-2	0	0	0
Fort Bend	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FRANKLIN	-13	0	0	0	0	0	0	0	-2	0	-5	0	672	-1	651	-1	-1	9

Table 72: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity and Natural Gas Savings (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). (Part 3)

Counties	Assembly		Education		Retail		Food		Lodging		Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
(square feet in thousands)																		
FREESTONE	0	0	-172	-1	0	0	0	0	-2	0	-4	0	0	0	-177	-1	0	6
FRIO	-8	0	-161	0	-79	0	-8	0	-16	0	-32	0	0	0	-304	-1	0	7
Galveston	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GILLESPIE	-98	0	-47	0	-214	0	-22	0	-40	0	-78	0	50	0	-449	-1	0	10
GLASSCOCK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GOLIAD	0	0	-25	0	0	0	0	0	0	0	0	0	0	0	-25	0	0	1
GONZALES	-13	0	-66	0	-30	0	-3	0	-19	0	-36	0	0	0	-167	0	0	4
GRAYSON	-317	-1	-915	-3	-708	0	-72	-1	-194	-1	-375	0	824	-1	-1756	-6	2	69
GRIMES	-40	0	-66	0	0	0	0	0	0	0	0	0	0	0	-106	0	0	4
Guadalupe	-232	-1	-1019	-3	-1009	0	-102	-1	-189	-1	-365	0	1161	-1	-1755	-7	2	77
HALL	0	0	-3	0	0	0	0	0	0	0	0	0	0	0	-3	0	0	0
HAMILTON	-6	0	-66	0	0	0	0	0	-28	0	-54	0	0	0	-153	0	0	4
HARDEMAN	-4	0	0	0	0	0	0	0	0	0	0	0	0	0	-4	0	0	0
Harris	-19953	-66	-26930	-79	-43334	-11	-4382	-34	-10354	-46	-20013	-13	49295	-54	-75671	-303	81	3240
HASKELL	-1	0	0	0	-98	0	-10	0	0	0	0	0	0	0	-109	0	0	1
Hays	-732	-2	-1398	-4	-1552	0	-157	-1	-260	-1	-503	0	466	-1	-4137	-10	4	108
Henderson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HIDALGO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HILL	-54	0	-417	-1	-118	0	-12	0	-17	0	-33	0	0	0	-652	-2	1	17
Hood	-304	-1	-359	-1	-145	0	-15	0	-25	0	-49	0	0	0	-897	-2	1	25
HOPKINS	-65	0	-141	0	-174	0	-18	0	-32	0	-62	0	114	0	-376	-1	0	12
HOUSTON	-24	0	-46	0	-295	0	-30	0	-41	0	-79	0	2	0	-512	-1	1	8
HOWARD	-58	0	-91	0	-20	0	-2	0	-33	0	-64	0	0	0	-268	-1	0	7
HUDSPETH	-6	0	-49	0	0	0	0	0	0	0	0	0	0	0	-55	0	0	2
Hunt	-270	-1	-852	-3	-299	0	-30	0	-96	0	-185	0	126	0	-1605	-4	2	47
IRION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JACK	-11	0	-5	0	0	0	0	0	0	0	0	0	0	0	-16	0	0	1
JACKSON	-16	0	-123	0	-9	0	-1	0	0	0	0	0	3	0	-147	0	0	5
JEFF DAVIS	-55	0	-1	0	0	0	0	0	0	0	0	0	0	0	-56	0	0	2
JIM HOGG	-4	0	-47	0	0	0	0	0	-4	0	-7	0	0	0	-61	0	0	2
JIM WELLS	-2	0	-276	-1	-253	0	-26	0	-91	0	-176	0	25	0	-798	-2	1	17
Johnson	-134	0	-1243	-4	-955	0	-97	-1	-28	0	-53	0	668	-1	-1843	-6	2	64
JONES	-70	0	-48	0	0	0	0	0	0	0	0	0	24	0	-94	0	0	4
KARNES	0	0	-55	0	-2	0	0	0	-8	0	-16	0	0	0	-81	0	0	2
Kaufman	-377	-1	-1476	-4	-714	0	-72	-1	-46	0	-90	0	1106	-1	-1669	-8	2	84
KENDALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENEDY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KENT	0	0	0	0	0	0	0	0	-9	0	-18	0	0	0	-27	0	0	1
KERR	-368	-1	-280	-1	-256	0	-26	0	-207	-1	-400	0	2	0	-1535	-3	2	37
KIMBLE	-14	0	-2	0	0	0	0	0	0	0	0	0	0	0	-16	0	0	1
KING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
KINNEY	0	0	-17	0	-5	0	-1	0	0	0	0	0	0	0	-23	0	0	1
KLEBERG	-64	0	-273	-1	-469	0	-47	0	-40	0	-78	0	8	0	-965	-2	1	19
KNOX	-7	0	-7	0	0	0	0	0	0	0	0	0	0	0	-14	0	0	0
LA SALLE	0	0	-11	0	-7	0	-1	0	-9	0	-17	0	0	0	-44	0	0	1
LAMAR	-63	0	-291	-1	-103	0	-10	0	-15	0	-28	0	18	0	-493	-1	1	14
LAMPASAS	-16	0	-55	0	-140	0	-14	0	-27	0	-53	0	0	0	-306	-1	0	6
LAVACA	-131	0	-25	0	-3	0	0	0	-6	0	-13	0	0	0	-178	-1	0	6
LEE	-8	0	-95	0	-13	0	-1	0	0	0	0	0	4	0	-113	0	0	3
LEON	-59	0	-38	0	0	0	0	0	0	0	0	0	0	0	-97	0	0	3
LIMESTONE	-31	0	-38	0	-131	0	-13	0	-17	0	-33	0	4	0	-260	0	0	5
LIVE OAK	-30	0	0	0	0	0	0	0	0	0	0	0	0	0	-30	0	0	1
LLANO	-4	0	-115	0	0	0	0	0	-185	-1	-357	0	0	0	-661	-1	1	15
LOVING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MADISON	-9	0	-104	0	-1	0	0	0	0	0	0	0	1	0	-114	0	0	4
MARTIN	0	0	-3	0	0	0	0	0	0	0	0	0	0	0	-3	0	0	0
MASON	0	0	-16	0	0	0	0	0	0	0	0	0	0	0	-16	0	0	0
MATAGORDA	-40	0	-181	-1	-65	0	-7	0	-41	0	-79	0	54	0	-358	-1	0	11
MAVERICK	-144	0	-303	-1	-175	0	-18	0	-145	-1	-280	0	5	0	-1061	-2	1	25
MCCULLOCH	-5	0	-71	0	0	0	0	0	0	0	0	0	0	0	-76	0	0	2
MCLENNAN	-908	-3	-2219	-7	-1669	0	-169	-1	-703	-3	-1358	-1	1139	-1	-5885	-16	6	176
MCMULLEN	-19	0	-4	0	0	0	0	0	0	0	0	0	0	0	-22	0	0	1
MEDINA	-70	0	-280	-1	-24	0	-2	0	-1	0	-1	0	11	0	-367	-1	0	12
MENARD	-3	0	-7	0	0	0	0	0	-1	0	-2	0	0	0	-12	0	0	0
MIDLAND	-810	-3	-353	-1	-1074	0	-109	-1	-210	-1	-406	0	121	0	-2840	-6	3	66
MILAM	-24	0	-219	-1	-112	0	-11	0	0	0	0	0	0	0	-366	-1	0	9
MILLS	-14	0	-45	0	0	0	0	0	0	0	0	0	0	0	-59	0	0	2
MITCHELL	-31	0	-1	0	-2	0	0	0	-20	0	-39	0	0	0	-94	0	0	2
MONTAGUE	-11	0	-71	0	-111	0	-11	0	-24	0	-46	0	5	0	-269	-1	0	5
Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MOTLEY	0	0	-4	0	0	0	0	0	0	0	0	0	0	0	-4	0	0	0

Table 73: Calculated ASHRAE Standard 90.1-1989 and 1999 OSD Electricity and Natural Gas Savings (USDOE 2004). A decrease in energy use is negative (i.e., savings); a positive value represents an energy use increase (+). (Part 4)

Counties	Assembly		Education		Retail		Food		Lodging		Office		Warehouse		Total		Total*1.07 (T&D loss) for eGrid	
	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	kWh/yr	mBtu/yr	MWh/yr	Therm/yr
(square feet in thousands)																		
NACOGDOCHES	-264	-1	-928	-3	-302	0	-31	0	-148	-1	-285	0	120	0	-1838	-5	2	52
NAVARRO	-64	0	-397	-1	-476	0	-48	0	-126	-1	-244	0	508	-1	-846	-3	1	34
NOLAN	-48	0	-97	0	-117	0	-12	0	-31	0	-60	0	0	0	-364	-1	0	8
Nueces	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PALO PINTO	-54	0	-211	-1	-238	0	-24	0	-15	0	-28	0	14	0	-556	-1	1	12
Parker	-116	0	-1027	-3	-1120	0	-113	-1	-203	-1	-392	0	56	0	-2915	-6	3	62
PECOS	-40	0	-50	0	-6	0	-1	0	-53	0	-103	0	0	0	-253	-1	0	6
PRESIDIO	-41	0	-51	0	0	0	0	0	0	0	0	0	3	0	-88	0	0	3
RAINS	-14	0	-121	0	0	0	0	0	0	0	0	0	0	0	-135	0	0	4
REAGAN	-7	0	0	0	0	0	0	0	-1	0	-2	0	0	0	-10	0	0	0
REAL	-4	0	-3	0	0	0	0	0	-14	0	-27	0	3	0	-46	0	0	1
RED RIVER	-28	0	-155	0	-2	0	0	0	0	0	0	0	0	0	-185	-1	0	6
REEVES	-42	0	-11	0	-6	0	-1	0	-16	0	-30	0	0	0	-105	0	0	3
REFUGIO	-16	0	-7	0	0	0	0	0	0	0	0	0	0	0	-23	0	0	1
ROBERTSON	-16	0	-25	0	0	0	0	0	-8	0	-15	0	11	0	-53	0	0	2
Rockwall	-295	-1	-1147	-3	-1395	0	-141	-1	-77	0	-149	0	299	0	-2905	-7	3	70
RUNNELS	0	0	-34	0	-9	0	-1	0	0	0	0	0	0	0	-44	0	0	1
Rusk	-10	0	-69	0	-243	0	-25	0	-7	0	-13	0	31	0	-336	-1	0	6
San Patricio	-170	-1	-469	-1	-382	0	-39	0	-111	0	-215	0	2260	-2	874	-5	-1	58
SAN SABA	-37	0	-15	0	-8	0	-1	0	0	0	0	0	0	0	-61	0	0	2
SCHLEICHER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCURRY	-2	0	-1	0	-23	0	-2	0	-5	0	-9	0	37	0	-4	0	0	1
SHACKELFORD	-16	0	-22	0	0	0	0	0	-9	0	-17	0	0	0	-63	0	0	2
Smith	-990	-3	-918	-3	-1413	0	-143	-1	-673	-3	-1300	-1	1337	-1	-4100	-13	4	136
SOMERVELL	-3	0	-49	0	-2	0	0	0	-3	0	-6	0	7	0	-55	0	0	2
STARR	-82	0	-971	-3	-36	0	-4	0	-25	0	-48	0	0	0	-1165	-3	1	35
STEPHENS	0	0	-34	0	0	0	0	0	-4	0	-9	0	0	0	-47	0	0	1
STERLING	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
STONEWALL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SUTTON	0	0	-37	0	0	0	0	0	-18	0	-34	0	0	0	-89	0	0	2
Tarrant	-9327	-31	-12890	-38	-27629	-7	-2794	-22	-5709	-25	-11034	-7	17418	-19	-51964	-149	56	1592
TAYLOR	-440	-1	-418	-1	-1361	0	-138	-1	-349	-2	-675	0	495	-1	-2885	-7	3	71
TERRELL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
THROCKMORTON	-9	0	0	0	0	0	0	0	0	0	0	0	0	0	-9	0	0	0
TITUS	-142	0	-549	-2	-292	0	-29	0	-2	0	-3	0	0	0	-1016	-2	1	26
TOM GREEN	-725	-2	-687	-2	-807	0	-82	-1	-601	-3	-1161	-1	287	0	-3777	-9	4	96
Travis	-4624	-15	-5022	-15	-12432	-3	-1257	-10	-4312	-19	-8335	-5	4293	-5	-31689	-72	34	770
UPTON	0	0	0	0	0	0	0	0	-2	0	-4	0	0	0	-6	0	0	0
UVALDE	-102	0	-155	0	-317	0	-32	0	-16	0	-31	0	42	0	-611	-1	1	13
VAL VERDE	-159	-1	-342	-1	-168	0	-17	0	-69	0	-134	0	43	0	-846	-2	1	23
VAN ZANDT	-26	0	-476	-1	-4	0	0	0	-2	0	-3	0	4	0	-507	-2	1	16
Victoria	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waller	-232	-1	-568	-2	-48	0	-5	0	0	0	0	0	741	-1	-112	-3	0	35
WARD	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0
WASHINGTON	-222	-1	-173	-1	-322	0	-33	0	-38	0	-74	0	136	0	-726	-2	1	21
WEBB	-452	-1	-2918	-9	-1141	0	-115	-1	-698	-3	-1349	-1	1413	-2	-5261	-17	6	180
WHARTON	-113	0	-127	0	-476	0	-48	0	-35	0	-68	0	102	0	-766	-2	1	17
WICHITA	-764	-3	-422	-1	-856	0	-87	-1	-962	-4	-1859	-1	265	0	-4685	-10	5	111
WILBARGER	-27	0	-39	0	-98	0	-10	0	-43	0	-83	0	9	0	-291	-1	0	6
WILLACY	-14	0	-209	-1	-266	0	-27	0	-4	0	-8	0	40	0	-489	-1	1	11
Williamson	-1640	-5	-3662	-11	-5631	-1	-569	-4	-778	-3	-1504	-1	1229	-1	-12557	-28	13	297
Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WINKLER	-11	0	-2	0	0	0	0	0	0	0	0	0	0	0	-13	0	0	0
WISE	-239	-1	-620	-2	-17	0	-2	0	-279	-1	-539	0	1	0	-1695	-4	2	45
YOUNG	-60	0	-82	0	-179	0	-18	0	-17	0	-33	0	7	0	-381	-1	0	8
ZAPATA	-19	0	-227	-1	-9	0	-1	0	-5	0	-10	0	0	0	-272	-1	0	8
ZAVALA	-4	0	-89	0	0	0	0	0	-16	0	-31	0	5	0	-135	0	0	4
Total	-69271	-229	-120633	-356	-169559	-43	-17146	-132	-45526	-202	-87996	-55	114264	-126	-395866	-1143	424	12226

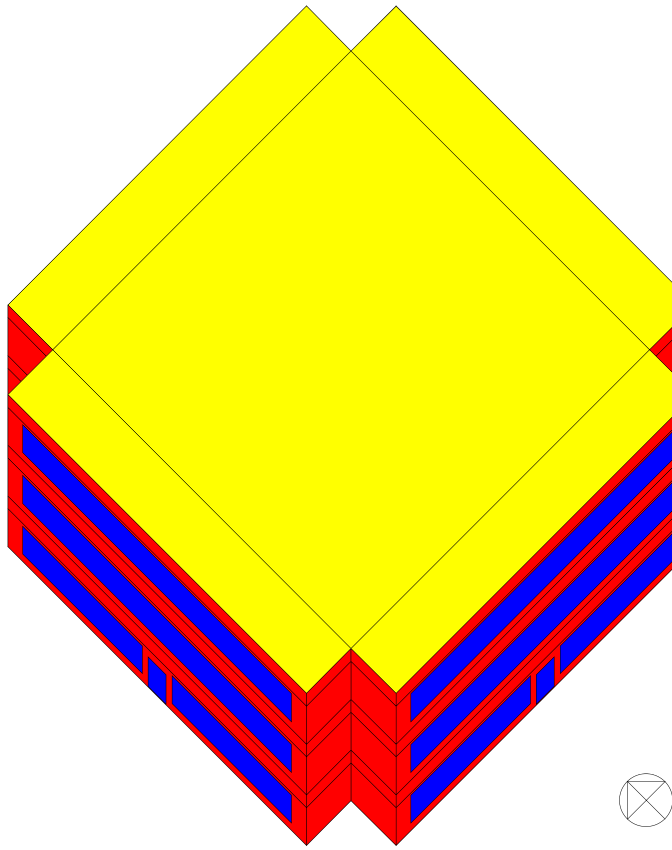


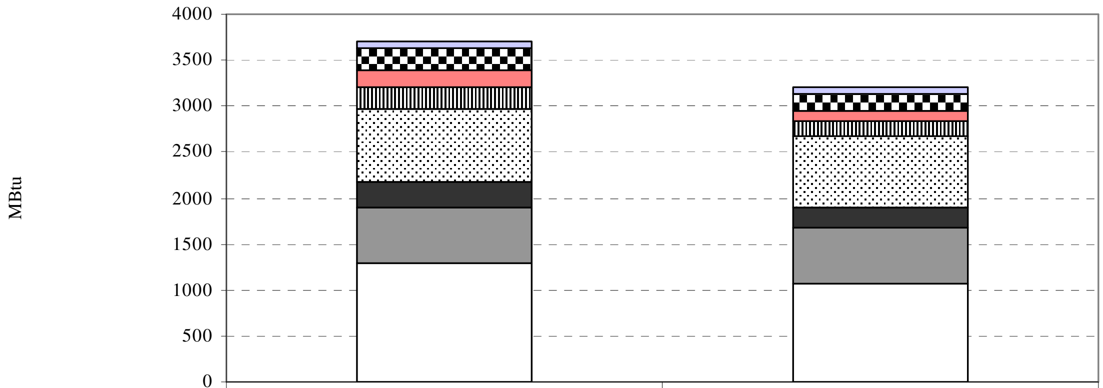
Figure 104: Typical Office Building Used for Annual to OSD calculation (3-story shown).

Table 74: Office/Retail Simulation Input Parameters (LOADS).

NAME	DESCRIPTION	DEFAULT	STATUS	COMMENT
LOADS				
b01	Quick or thermal mode (Q or T)	Quick (Q)	Fixed	Q simulates the building as massless, T will include thermal mass
b02	Location	Bastrop (BAS)	User Defined	41 counties linked to 9 TRY packed weather files according to climate zone
b03	Azimuth of building (degree)	0	User Defined	Orientation of the building
b04	Length of building (ft)	122	User Defined	
b05	Width of building (ft)	122	User Defined	
b06	Floor to ceiling height (ft)	9	User Defined	
b07	Door height (ft)	7	Fixed	
b08	Door width (ft)	6	Fixed	
b09	Run year	2000	User Defined	
b10	Floor to floor height (ft)	13	User Defined	This defines the plenum height in conjunction with b06
b11	Number of floor	6	User Defined	
b12	Perimeter depth (ft)	15	Fixed	Used for thermal zoning
b13	Void			
b14	Underground floor mode	No (N)	User Defined	This allows the user to activate/deactivate underground floors
b15	Front wall: Attached to another building?	No (N)	User Defined	These 4 parameters are used to attach buildings to the different orientations of the model for the retail scenario
b16	Right wall: Attached to another building?	No (N)	User Defined	
b17	Back wall: Attached to another building?	No (N)	User Defined	
b18	Left wall: Attached to another building?	No (N)	User Defined	
b19	Building type	Office (O)	User Defined	Allows the user to switch between Office and Retail
b20	Code compliance	Code (C)	User Defined	Allows user to run user defined model or either of ASHRAE 90.1 1989 or 1999
c01	Roof absorptance	0.45	User Defined	c01 and c03 are used to determine "roof color"
c02	Roof roughness	1	Fixed	This is used to calculate the outside film coefficient for heat transfer calculations, DOE-2 allows values from 1 to 6 increasing in smoothness
c03	Roof outside emissivity	0.89	User Defined	c01 and c03 are used to determine "roof color"
c04	Roof insulation R-value (hr-sq.ft-F/Btu)	R-15	User Defined	
c05	Wall absorptance	0.57	User Defined	c05 and c07 are used to define "wall color"
c06	Wall roughness	2	Fixed	This is used to calculate the outside film coefficient for heat transfer calculations, DOE-2 allows values from 1 to 6 increasing in smoothness
c07	Wall outside emissivity	0.9	User Defined	c05 and c07 are used to define "wall color"
c08	Wall insulation R-value (hr-sq.ft-F/Btu)	R-13	User Defined	
c09	Ground reflectance	0.24	Fixed	This defines the fraction of sunlight reflected from the ground
c10	Void			
c11	U-Factor of glazing (Btu/hr-sq.ft-F)	1.22	User Defined	
c12	Solar Heat Gain Coefficient(SHGC)	0.17	User Defined	
c13	Number of pane of glazing	1	Fixed	
c14	Frame absorptance of glazing	0.7	Fixed	
c15	Frame type - A,B,C,D,E	Aluminum w/o thermal break (A)	User Defined	Allows user to select from 5 different frame types
c16	Void			
c17	Floor weight (lb/sq-ft)	70	User Defined	This corresponds to medium construction, user has a choice of light, medium or heavy construction
c18	Slab-on-grade floor insulation R-value (Exterior insulation, horizontal) (hr-sq.ft-F/Btu)	R-0 (A)	User Defined	User can choose from 9 insulation R-values and insulation depths
c19	Slab-on-grade floor R-value (hr-sq.ft-F/Btu)	0.88	Fixed	
c20	Below-grade wall insulation R-value (hr-sq.ft-F/Btu) (Exterior insulation, vertical, basement wall = 8 ft)	R-0 (A)	User Defined	User can choose from 9 insulation R-values
c21	Below-grade wall R-value (concrete wall) (hr-sq.ft-F/Btu)	0.88	Fixed	
c22	Void			
c23	Floor R-value	1.67	Fixed	
c24	Void			
c25	Ceiling R-value (hr-sq.ft-F/Btu)	1.89	Fixed	
c26	Interior wall R-value (hr-sq.ft-F/Btu)	2.01	Fixed	
c27	Percent window-front (%)	50	User Defined	
c28	Percent window-right (%)	50	User Defined	
c29	Percent window-back (%)	50	User Defined	
c30	Percent window-left (%)	50	User Defined	
sp01	void			
sp02	void			
sp03	Area per person (ft^2/person) for office	275	User Defined	
sp04	Lighting load (W/ft2) for office	1.3	User Defined	
sp05	Equipment load (W/ft2) for office	0.75	User Defined	
sp06	Area per person (ft^2/person) for retail	300	User Defined	
sp07	Lighting load (W/ft2) for retail	1.9	User Defined	
sp08	Equipment load (W/ft2) for retail	0.25	User Defined	
s01	Front Shade (S)	0	User Defined	
s02	Back Shade (N)	0	User Defined	
s03	Left Shade (W)	0	User Defined	
s04	Right Shade (E)	0	User Defined	

Table 75: Office/Retail Simulation Input Parameters (SYSTEMS and PLANT).

NAME	DESCRIPTION	DEFAULT	STATUS	COMMENT
SYSTEM				
sy01	Mode of system	Variable air volume (2)	User Defined	User can choose from Packaged single zone, variable air volume or packaged variable volume system
sy02	Cooling Capacity of cooling system (Btu/hr)	0	Fixed	DOE-2 is autosizing the system
sy03	Heating Capacity of heating system (Btu/hr)	0	Fixed	DOE-2 is autosizing the system
sy04	Seasonal Energy Efficiency Ratio (SEER) for PVAVS and PSZ	10	User Defined	
sy05	ANNUAL FUEL UTILIZATION EFFICIENCY (AFUE) for PSZ	0.8	User Defined	
sy06	**Spare parameter for systems other than VAVS**HEATING SEASONAL PERFORMANCE FACTOR (HSPF)	6.8	User Defined	Unused, since heatpump systems are not included in the office/retail scenario
sy07	**Spare parameter for Pilot light	0	Fixed	Unused
sy08	**Spare parameter for Pilot light	0	Fixed	Unused
sy09	**Spare parameter for Pilot light	0	Fixed	Unused
sy10	Void			
sy11	Exterior lighting (kW)	0	Fixed	
sy12	Void			
sy13	Fan control type	Variable frequency drives (1)	User Defined	User can choose from 4 different type of fan control
sy14	Economizer type	None (1)	User Defined	
sy15	Economizer drybulb limit (F) (use when economizer type(sy14) = dry bulb(2))	65	Fixed	This corresponds to the temperature above which the outside air dampers return to the minimum position
sy16	User input for numbers of fans	Autosized (A)	Fixed	Autosized by DOE-2
sy17	Number of Fans	6	Fixed	equal to the number of floors
sy18	Supply fan total pressure (in W.G)	5.5	Fixed	
sy19	Supply fan efficiency	0.54	Fixed	
sy20	Return fan total pressure (in W.G)	2	Fixed	
sy21	Return fan efficiency	0.51	Fixed	
sy22	Supply motor efficiency	0.5	Fixed	
sy23	Return motor efficiency	0.5	Fixed	
sy24	User input for DHW gallon/hr-person	Autosized (A)	Fixed	The size of DHW depends on the gallons per hour per person requirements of ASHRAE 90.1
sy25	Maximum DHW gallon/h-person (maximum hourly, to be used with occupancy schedule)	0.4	Fixed	
PLANT				
p01	Chiller type	Electric Centrifugal (1)	Fixed	
p02	Number of chillers	1	Fixed	
p03	Chillers size (MBtu/h)	-999	Fixed	Chiller is being autosized by DOE-2
p04	Condenser type	water-cooled (W)	Fixed	
p05	COP	5	User Defined	
p06	Switch for a chiller sizing	Autosized (A)	Fixed	Chiller is being autosized by DOE-2
p07	Cooling tower type	Open tower (O)		
p08	Void			
p09	Gpm/hp	38.2	Fixed	Value from ASHRAE 90.1 1999 for axial fan cooling towers
p10	Cooling tower capacity control	Two-speed fan (1)	Fixed	
p11	Boiler type	Gas fired-hotwater boiler (1)	User Defined	User can choose from gas fired or electric boilers
p12	Number of boilers	1	Fixed	
p13	Boiler size (MBtu/h)	-999	Fixed	Boiler is being autosized by DOE-2
p14	Boiler fuel type	Gas (G)	Fixed	Depends on the value of p10
p15	Boilers efficiency (Et,Ec,AFUE) (%)	80	User Defined	
p16	Switch for a boiler sizing	Autosized (A)	Fixed	Boiler is being autosized by DOE-2
p17	Void			
p18	DHW heater type	Gas water heater (1)	User Defined	User can choose from gas fired or electric water heaters
p19	Number of DHW heater	1	Fixed	
p20	DHW size (MBtu/h)	-999	Fixed	Water heater is being autosized by DOE-2
p21	DHW fuel type	Gas (G)	Fixed	Depends on the value of p18
p22	DHW heater Efficiency (Et,Ec,Energy factor) (%)	54	User Defined	
p23	Switch for a DHW heater sizing	Autosized (A)	Fixed	Water heater is being autosized by DOE-2
p24	DHW Storage Capacity (gal)	75	Fixed	



	ASHRAE 90.1-1989	ASHRAE 90.1-1999
DOMHOT WATER	71.5	71.5
VENT FANS	239.2	177.9
PUMPS & MISC	184.1	111.2
HEAT REJECT	233.9	174.3
SPACE COOL	798.1	774.3
SPACE HEAT	272.1	214.3
MISC EQUIPMT	616.2	616.2
AREA LIGHTS	1289.9	1068.1

AREA LIGHTS, MISC EQUIPMT, SPACE HEAT, SPACE COOL, HEAT REJECT, PUMPS & MISC, VENT FANS, DOMHOT WATER

Figure 105: Comparison of Annual Energy Use ASHRAE Standard 90.1-1989 vs 90.1-1999.

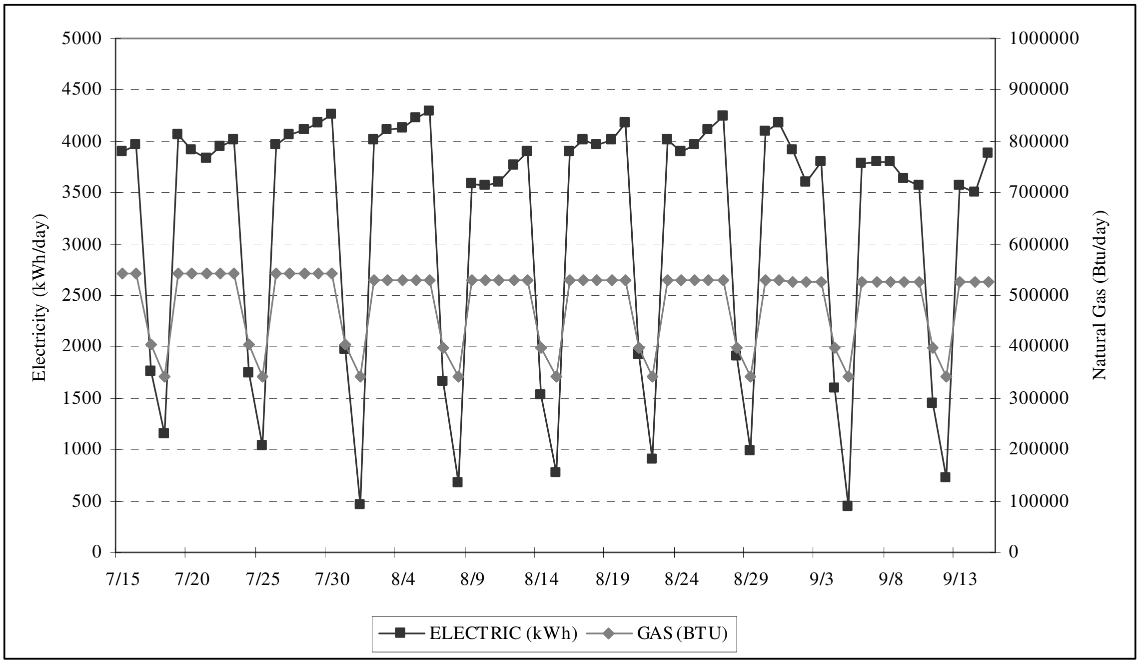


Figure 106: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for OSD (07/15 – 09/15).

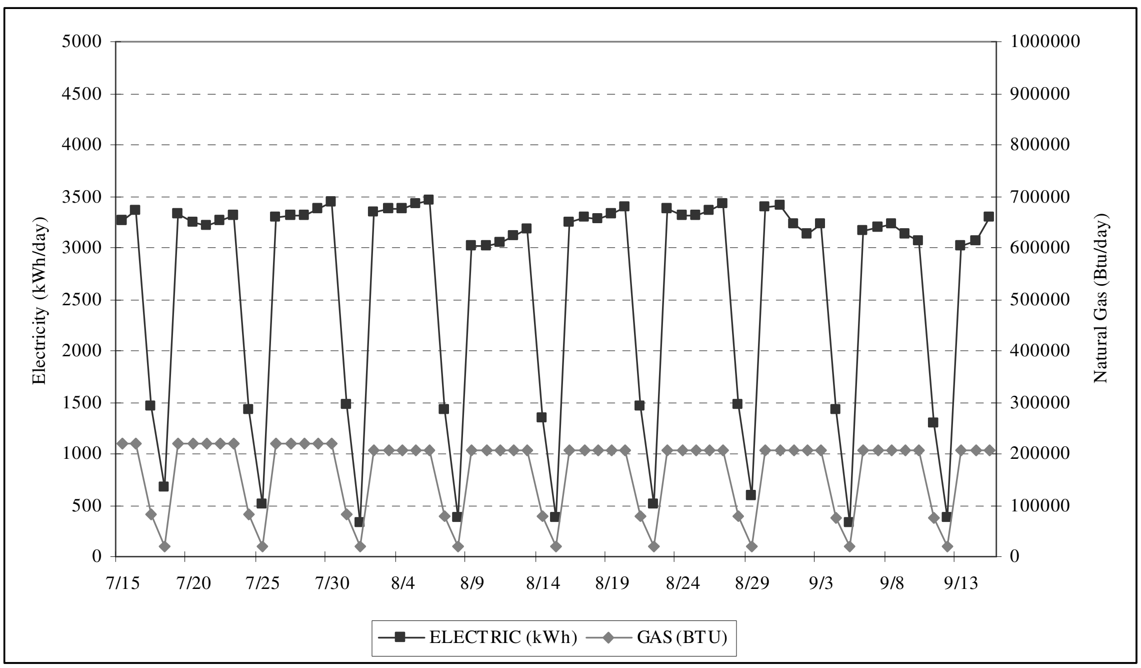


Figure 107: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for OSD (07/15 – 09/15).

Table 76: Simulated Electricity and Natural Gas for Building Built to 90.1-1989 Standard for Annual and OSD (07/15 – 09/15).

	Electricity (kW)		Gas (Btu)	
	1989	1999	1989	1999
TOTAL (YEAR) (a)	988,405	858,198	331,600,000	278,800,000
OSD (07/15 - 09/15)	199,537	163,841	30,633,205	10,332,355
OSD PER DAY (b)	3167	2601	486241	164006
OSD % (b/a)	0.32%	0.30%	0.15%	0.06%

Table 77: Totalized Annual Electricity Savings from 90.1-1999 by PCA for Commercial Buildings.

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West (ERCOT)/PCA	6,940.30
Austin Energy/PCA	294.14
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	1,038.36
Reliant Energy HL&P/PCA	15,232.42
San Antonio Public Service Bd /PCA	11,156.39
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	795.59
TXU Electric/PCA	47,154.21
El Paso Electric Co/PCA	39.54
Entergy Electric System/PCA	4,568.53
Total	87,219.47

Table 78: 2007 Annual NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
	Brazoria	0.00883113	61.2906791	0.010890729	3.20335762	0.006522185	0	0.003944232	4.095522035	0.0654443	996.8749878	0.014877434	165.978461	0.006262315	0	0.0048171	0	0.121274957	96.48469729	0.00816387	384.9608565	1712.888562	0.856444281
	Chambers	0.02176222	151.036281	0.026955801	7.92867681	0.016072371	0	0.009076193	9.424331567	0.1649402	2512.438914	0.037472294	418.055545	0.015055623	0	0.0095532	0	0.011518588	9.164031268	0.01581859	745.9132455	3853.961025	1.926980513
	Fort Bend	0.07043123	488.813667	0.087239726	25.6603615	0.052016606	0	0.029374182	30.50089704	0.5338124	8131.25473	0.121275295	1352.99454	0.048726002	0	0.030918	0	0.037278747	29.65846142	0.05119528	2414.072865	12472.95552	6.23647776
Houston-Galveston Area	Galveston	0.03385674	234.975819	0.041710519	12.2685734	0.025004711	0	0.015351589	15.9404346	0.2495874	3801.819976	0.056747051	633.092262	0.024143087	0	0.0192972	0	0.567751219	451.6951073	0.03283689	1548.39749	6698.189662	3.349094831
	Harris	0.06826733	473.795549	0.084559408	24.8719828	0.050418468	0	0.028471701	29.56379957	0.5174117	7881.433283	0.117549281	1311.42567	0.047228963	0	0.0299681	0	0.03613341	28.74724661	0.04962237	2339.903847	12089.74138	6.044870689
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Collin	0.00203914	14.1522032	0.003716345	1.09311149	0.001505992	0	0.005950953	6.179215335	0.0024815	37.79891991	0.000717051	7.999698	0.019166247	0	0.0766809	0	0.00086441	0.687712893	0.0040002	188.6262433	256.5371041	0.128268552
	Dallas	0.00453947	31.5052771	0.004683963	1.37772296	0.003352602	0	0.00774211	8.039076585	0.0020856	31.76890738	0.00068106	7.59817493	0.007502816	0	0.026717	0	0.007524933	5.98673387	0.04037045	1903.636912	1989.912805	0.994956402
	Denton	0.00047388	3.28886988	0.000872802	0.25672252	0.000349982	0	0.001396994	1.450578791	0.0005854	8.917719596	0.000168971	1.88510104	0.00454374	0	0.0181872	0	0.000186605	0.148460779	0.00084941	40.05304096	56.00049357	0.028000247
	Tarrant	0.01216249	84.4113067	0.012266309	3.60796562	0.008982543	0	0.020308652	21.08763777	0.0053165	80.98323367	0.001752506	19.5516421	0.017326428	0	0.0602168	0	0.020603444	16.39181864	0.11064724	5217.483183	5443.516787	2.721758394
	Ellis	0.00327981	22.7628794	0.003307809	0.97294651	0.002422289	0	0.005476558	5.686623915	0.0014337	21.83844385	0.000472592	5.27241774	0.004672353	0	0.0162384	0	0.005556053	4.420320043	0.02983782	1406.979054	1467.932685	0.733966343
Dallas/ Fort Worth Area	Johnson	0.00028606	1.98533076	0.000526868	0.1549709	0.000211267	0	0.000843297	0.875643851	0.0003534	5.38319351	0.000101999	1.1379438	0.002742835	0	0.0109787	0	0.000112645	0.08961855	0.00051274	24.17807241	33.80477378	0.016902387
	Kaufman	0.00632545	43.900518	0.006379446	1.87642587	0.004671629	0	0.010562096	10.96723007	0.002765	42.11765039	0.000911441	10.1683915	0.009011105	0	0.0313175	0	0.010715411	8.525034819	0.05754527	2713.501581	2831.056832	1.415528416
	Parker	0.00021749	1.50944155	0.000400576	0.11782395	0.000160626	0	0.000641157	0.665749629	0.0002687	4.092827326	7.75498E-05	0.86517556	0.00208537	0	0.0083471	0	8.56434E-05	0.068136739	0.00038984	18.38252243	25.7016772	0.012850839
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00081989	5.69031418	0.000826893	0.24321929	0.000605529	0	0.001369042	1.421554634	0.0003584	5.459221764	0.00011814	1.31801047	0.001168005	0	0.0040593	0	0.001388914	1.105001233	0.00745892	351.7196888	366.9570104	0.183478505
	Hood	0.01252711	86.941861	0.012634039	3.7161283	0.009251829	0	0.020917482	21.719821	0.0054759	83.41101828	0.001805044	20.1377779	0.017845854	0	0.062022	0	0.021221112	16.88322659	0.11396431	5373.897354	5606.707187	2.803353593
	Hunt	0.00618756	42.9434916	0.006240374	1.83552	0.004569788	0	0.010331844	10.72814568	0.0027047	41.19949032	0.000891572	9.94672172	0.008814664	0	0.0306347	0	0.010481817	8.339190013	0.05629078	2654.34755	2769.340109	1.384670055
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bexar	0.03341375	231.90135	0.051775843	15.2291498	0.024677545	0	0.090663423	94.14103	0.0011418	17.39300648	1.143571754	12758.133	0.046873844	0	0.0046695	0	0.000519582	0.413372594	0.00250387	118.0677873	13235.27869	6.617639345
San Antonio Area	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200047	13.8838359	0.076378745	22.4657536	0.001477434	0	0.133848731	138.9828103	0.0012371	18.8445268	0.003554796	39.6586952	0.001061766	0	0.0018557	0	0.000401718	0.31960161	0.00183516	86.53574925	320.6909728	0.160345486
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bastrop	0.00450233	31.247533	0.171901148	50.5623504	0.003325174	0	0.301245466	312.800437	0.0027843	42.41226832	0.008000571	89.2574927	0.002389654	0	0.0041765	0	0.000904124	0.719308546	0.0041303	194.7609214	721.7603114	0.360880156
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Hays	0.0024586	17.0634078	0.093870431	27.6106919	0.001815785	0	0.164501762	170.8116103	0.0015205	23.16015898	0.004368889	48.7410319	0.001304924	0	0.0022807	0	0.000493717	0.392794372	0.00225544	106.3535171	394.1332124	0.197066606
	Travis	0.00051001	3.53960004	0.299602906	88.1240599	0.000376663	0	0.033939476	35.24130382	0.0003347	5.098425051	0.000906121	10.1090398	0.000271138	0	0.0004717	0	0.000103327	0.082205443	0.00046734	22.03684954	164.2314836	0.082115742
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Rusk	0.00068596	4.7607996	0.00069182	0.20348934	0.000506616	0	0.001145408	1.189343245	0.0002999	4.567456202	9.88414E-05	1.10271305	0.000977211	0	0.0033962	0	0.001162035	0.92449894	0.00624051	294.266169	307.0144693	0.153507235
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	1579.39453	0.004556851	1.34033492	0.168069652	0	0.007612767	7.904772513	0.0016809	25.60399115	0.001626796	18.1491712	0.046792036	0	0.0072464	0	0.001609426	1.28043729	0.00828339	390.596943	2024.270182	1.012135091
	San Patricio	0.05031335	349.189592	0.001007478	0.29633571	0.037158653	0	0.001683113	1.747672434	0.0003716	5.660806742	0.000359667	4.01261467	0.010345288	0	0.0016021	0	0.000355829	0.283092898	0.00183138	86.3573884	447.5475024	0.223773751
Victoria Area	Victoria	0.02183674	151.553427	0.002215582	0.65168292	0.016127403	0	0.003612695	3.751268601	0.0011996	18.27313368	0.000555389	6.19613424	0.52545648	0	0.0324127	0	0.000476855	0.379379586	0.00225485	106.3256335	287.1306596	0.14356533
	Andrews	2.4742E-05	0.1717174	2.49533E-05	0.00733966	1.82731E-05	0	4.13138E-05	0.042898451	1.082E-05	0.164743689	3.56511E-06	0.03977378	3.5247E-05	0	0.0001225	0	4.19135E-05	0.033345775	0.00022509	10.61389364	11.0737124	0.005536856
	Angelina	0.00031082	2.1571825	0.000313473	0.09220377	0.000229554	0	0.000519	0.538907463	0.0001359	2.069575998	4.47864E-05	0.49965416	0.000442787	0	0.0015389	0	0.000526534	0.418902937	0.00282766	133.3359694	139.1123962	0.069556198
	Bosque	0.00059539	4.13219561	0.001096604	0.32255082	0.000439723	0	0.001755208	1.822533432	0.0007356	11.20438421	0.000212298	2.36847505	0.005708837	0	0.0228507	0	0.000234455	0.186528809	0.00106721	50.32336518	70.36003312	0.035180017
	Brazos	0.00193973	13.4622687	0.003572622	1.05083743	0.001432574	0	0.005718288	5.937626626	0.0023964	36.50273232	0.000691644	7.71624832	0.018598805	0	0.0744451	0	0.000763829	0.607691689	0.00347685	163.9483522	229.2257572	0.114612879
	Calhoun	0.08269981	573.961219	0.001655986	0.48708556	0.061077496	0	0.002766524	2.872640605	0.0006108	9.304640269	0.000591187	6.59551504	0.0170045	0	0.0026334	0	0.000584875	0.465318407	0.00301023	141.9452156	735.631634	0.367815817
	Cameron	0.04837175	335.714281	0.000968599	0.28490005	0.297964476	0	0.001618161	1.680229335	0.0003573	5.44235485	0.00034579	3.8577669	0.009946061	0	0.0015403	0	0.000342098	0.272168275	0.00176071	83.02483604	430.2765368	0.215138268
	Cherokee	0.0035039	24.3180984	0.003533808	1.03942074	0.002587786	0	0.00585073	6.075148815	0.0015316	23.33050299	0.00050488	5.632643	0.00499158	0	0.0173479	0	0.005935657	4.722327777	0.03187642	1503.107513	1568.225655	0.784112828
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.00129879	9.01396644	2.6007E-05	0.0076496	0.000959212	0	4.34478E-05	0.045114348	9.593E-06	0.146127844	9.2845E-06	0.10358148	0.000267053	0	4.136E-05	0	9.18536E-06	0.007307749	4.7275E-05	2.229226243	11.5529737	0.005776487
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00353575	24.539138	0.003565928	1.04886857	0.002611307	0	0.005903911	6.130368958	0.0015456	23.5425659	0.00050947	5.68384098	0.005036951	0	0.0175056	0	0.00598961	4.765251436	0.03216616	1516.770029	1582.480062	0.791240031
	Fannin	0.00705631	48.9729184	0.007116546	2.09323387	0.005211403	0	0.011782473	12.23441746	0.0030845	46.98405287	0.001016752	11.3432787	0.010052276	0	0.034936	0	0.011953503	9.510043484	0.06419422	3027.027875	3158.16582	1.57908291
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00367718	25.5207036	0.003708565	1.09082331	0.00271576	0	0.006140067	6.375583717	0.0016074	24.48426853	0.000529848	5.91119462	0.005238429	0	0.0182058	0	0.006229194	4.955861493	0.03345281	1577.44083	1645.779265	0.822889632
	Frio	0.00858833	59.6055916	0.000871383	0.2563053	0.006342868	0	0.001420864	1.475364752	0.0004718	7.186778715	0.000218433	2.43692442	0.206660746	0	0.0127478	0	0.000187546	0.149209062	0.00088683	41.81761122	112.9277851	0.056463893
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.18852746	1308.4365	0.003775086	1.11038952	0.139235931	0	0.006306735	6.548644234	0.0013925	21.21141738	0.001347706	15.0355326	0.03876448	0	0.0060032	0	0.001333316	1.060767816	0.00686231	323.5868476	1676.990101	0.83849505
	Howard	0.00055511	3.85264931	0.000559851	0.16467256	0.000409976	0	0.000926915	0.962469086	0.0002427	3.696187298	7.99868E-05	0.89236411	0.000790802	0	0.0027484	0	0.00094037	0.748145377	0.00505009	238.1331813	248.4496691	0.124224835
	Jack	0.00212145	14.7234828	0.002139557	0.62932114	0.001566784	0	0.003542346	3.678221375	0.0009273	14.12553954	0.000305682	3.41030459	0.00302217	0	0.0105033	0	0.003593766	2.859150862	0.0192997	910.0620172	949.4880375	0.474744019
	Jones	0.04071872	282.600018	0.000815354	0.23982524	0.030072592	0	0.001362147	1.414395712	0.0003008	4.581305184	0.000291082	3.24741918	0.008372468	0	0.0012966	0	0.000287974	0.229107797	0.00148214	69.8892524	362.2013233	0.181100662
Other ERCOT counties	Lamar	0.00095084	6.59909687	0.000958954	0.2820631	0.000702236	0	0.001587687	1.64858678	0.0004156	6.331097391	0.000137007	1.5285059	0.001354543	0	0.0047076	0	0.001610734	1.281477604	0.00865017	407.8917656	425.5625932	0.212781297
	Limestone	0.00071976	4.99532571	0.000891528	0.26223052	0.000531572	0	0.000300183	0.311697331	0.0054552	83.09560176	0.001239347	13.8266355	0.000497945	0	0.000316	0	0.000380962	0.303088242	0.00052318	24.67009632	127.4646754	0.063732338
	Llano	0.00123817	8.59329475	0.047274044	13.9050075	0.000914447	0	0.082844655	86.02235428	0.0007657	11.66367671	0.002200214	24.546448	0.000657172	0	0.0011486	0	0.000248641	0.197814988	0.00113586	53.56064443	198.4892406	0.09924462
	McLennan	0.02453432	170.275444	0.024743738	7.27802912	0.018119687	0	0.040966843	42.53822173	0.0107245	163.3602961	0.003535175	39.4397939	0.034951066	0	0.1214699	0	0.041561501	33.0657622	0.22319886	10524.76617	10980.72371	5.490361856
	Milam	0.0022454	15.5837766	0.002264571	0.6660924	0.001658332	0	0.003749326	3.893140012	0.0009815	14.95089544	0.000323543	3.60956884	0.003198756	0	0.011117	0	0.00380375	3.026211172	0.02042738	963.2369809	1004.966665	0.502483333
	Mitchell	0.01494317	103.710026	0.015070721	4.43284465	0.011036196	0	0.024951762	25.90884507	0.006532	99.49820257	0.002153177	24.021679	0.02128772	0	0.073984	0	0.025313952	20.13943402	0.1359442	6410.341686	6688.052717	3.344026359
	Nolan	0.00056465	3.9188643	0.000569473	0.16750277	0.000417022	0	0.000942846	0.979010917	0.0002468	3.759713188	8.13615E-05	0.90770105	0.000804394	0	0.0027956	0	0.000956532	0.761003654	0.00513689	242.2259453	252.7197412	0.126359871
	Palo Pinto	0.003207	22.2575204	0.005906709	1.73737696	0.002368511	0	0.009454195	9.816833181	0.003962	60.35092074	0.001143513	12.7574749	0.030749889	0	0.1230821	0	0.001262858	1.004712542	0.00574838	271.0600927	378.9849313	0.189492466
	Pecos	4.0968E-05	0.28432785	4.13174E-05	0.01215293	3.02565E-05	0	6.84069E-05	0.071030801	1.791E-05	0.27278086	5.90308E-06	0.06585701	5.83617E-05	0	0.0002028	0	6.93999E-05	0.055213582	0.0003727	17.57437292	18.33573596	0.009167868
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00073771	5.11991062	0.000835096	0.24563208	0.00054483	0	0.000735917	0.76414487	0.0031497	47.97721781	0.000730875	8.15393017	0.00076086	0	0.0018663	0	0.191632518	152.4602113	0.00339774	160.2176269	374.9386738	0.187469337
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.00569644	39.5349661	0.005745061	1.68983048	0.004207073	0	0.009511781	9.876627645	0.00249	37.92939035	0.000820806	9.15722714	0.008115023	0	0.0282032	0	0.00964985	7.677288983	0.05182285	2443.665772	2549.531103	1.274765552
	Tom Green	0.00148245	10.2886295	2.96846E-05	0.00873133	0.001094854	0	4.95918E-05	0.051493958	1.095E-05	0.16679175	1.05974E-05	0.11822891	0.000304817	0	4.72E-05	0	1.04843E-05	0.008341136	5.396E-05	2.544460644	13.18667722	0.006593339
	Upton	3.1166E-05	0.21630217	3.14322E-05	0.00924533	2.30176E-05	0	5.20405E-05	0.054036622	1.362E-05	0.207517807	4.49076E-06	0.05010067	4.43986E-05	0	0.0001543	0	5.27959E-05	0.042003685	0.00028353	13.36968926	13.94889555	0.006974448
	Ward	0.01855953	128.808637	0.01871795	5.5056266	0.013707039	0	0.030990277	32.17898159	0.0081128	123.5775203	0.002674262	29.8351071	0.026439509	0	0.0918886	0	0.03144012	25.01332942	0.16884373	7961.69287	8306.612073	4.153306036
	Webb	0.02001433	138.905372	0.000400768	0.11788044	0.014781473	0	0.000669531	0.695212843	0.0001478	2.251832479	0.000143074	1.59619228	0.004115289	0	0.0006373	0	0.000141547	0.112612532	0.00072851	34.35241316	178.0315153	0.089015758
	Wharton	0.00014434	1.00176034	0.000178787	0.05258759	0.000106601	0	6.01986E-05	0.062507641	0.001094	16.6639541	0.000248538	2.77278718	9.98576E-05	0	6.336E-05	0	7.6398E-05	0.060781178	0.00010492	4.94732987	25.5617079	0.012780854
	Wichita	0.00020763	1.44103611	0.000209406	0.06159375	0.000153346	0	0.000346701	0.359999727	9.076E-05	1.382513412	2.99181E-05	0.33377782	0.00029579	0	0.001028	0	0.000351734	0.279834579	0.00188893	89.0707885	92.9295439	0.046464772
	Wilbarger	0.02861682	198.609211	0.000573025	0.16854741	0.021134796	0	0.000957307	0.994026891	0.0002114	3.219707546	0.00020457	2.28226228	0.005884109	0	0.0009112	0	0.000202386	0.161015272	0.00104164	49.11765191	254.5524227	0.127276211
	Wise	0.00284449	19.7415879	0.002882008	0.84770289	0.002100781	0	0.00476997	4.952933797	0.0012561	19.1330683	0.000413241	4.61028116	0.004181914	0	0.0146143	0	0.004797945	3.817179113	0.02576141	1214.759021	1267.861774	0.633930887
	Young	0.00623586	43.2786937	0.006289085	1.84984744	0.004605458	0	0.010412491	10.8118859	0.0027258	41.52107941	0.000898531	10.0243624	0.008883468	0	0.0308739	0	0.010563634	8.404282869	0.05673017	2675.066476	2790.956628	1.395478314
	Total	**1.12183722**	**7785.88328**	**1.172570094**	**344.89531**	**1.090766584**	**0**	**1.189130767**	**1234.742646**	**1.62936**	**24819.09725**	**1.542362643**	**17207.1999**	**1.359385821**	**0**	**1.2316428**	**0**	**1.221806085**	**972.0522161**	**1.52878695**	**72088.74233**	**124452.6129**	**62.22630644**

Energy Savings by PCA (MWh)		6,940.30		294.14		0.00		1,038.36		15,232.42		11,156.39		0.00		0.00		795.59		47,154.21	

Table 79: 2007 Totalized OSD Electricity Savings from IECC / IRC by PCA for Commercial Buildings (w/7% T&D).

PCA	Total Electricity Savings by PCA (MWh)
American Electric Power - West (ERCOT)/PCA	42.63
Austin Energy/PCA	1.66
Brownsville Public Utils Board/PCA	0.00
Lower Colorado River Authority/PCA	5.58
Reliant Energy HL&P/PCA	111.08
San Antonio Public Service Bd /PCA	65.44
South Texas Electric Coop Inc/PCA	0.00
Texas Municipal Power Pool/PCA	0.00
Texas-New Mexico Power Co/PCA	4.25
TXU Electric/PCA	301.65
El Paso Electric Co/PCA	0.20
Entergy Electric System/PCA	35.36
Total	567.85

Table 80: 2007 OSD NOx Reductions from Electricity Savings from the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID (w/7% T&D).

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs/year)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/P CA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
	Brazoria	0.00957217	0.4080826	0.011806715	0.019587275	0.007069474	0	0.004263638	0.023771286	0.0710018	7.887086808	0.016140391	1.056183188	0.006781035	0	0.0051797	0	0.126288	0.53694699	0.008772	2.645973483	12.57763163	0.006288816
	Chambers	0.0218814	0.93285192	0.027103415	0.044964417	0.016160386	0	0.009125896	0.050880092	0.1658435	18.42238357	0.037677498	2.465512824	0.01513807	0	0.0096055	0	0.011582	0.04924251	0.015905	4.797813672	26.76364901	0.013381825
	Fort Bend	0.05569551	2.37442196	0.068987309	0.114449566	0.041133619	0	0.023228475	0.129506951	0.4221274	46.89116356	0.095901908	6.275559547	0.038531479	0	0.0244493	0	0.029479	0.12533875	0.040484	12.2120498	68.12249014	0.034061245
Houston-Galveston Area	Galveston	0.02755599	1.17477214	0.033893644	0.056229368	0.020351324	0	0.012791501	0.071317138	0.2014466	22.3772894	0.045812515	2.997846172	0.019823685	0	0.0167751	0	0.594657	2.52833919	0.028709	8.66021505	37.86600846	0.018933004
	Harris	0.07736057	3.29805105	0.09582276	0.158969433	0.057134232	0	0.032264145	0.179884007	0.5863312	65.13141042	0.1332069	8.716696569	0.053519883	0	0.0339599	0	0.040946	0.17409442	0.056232	16.9624289	94.6215348	0.047310767
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Collin	0.00176365	0.07518822	0.003151138	0.00522772	0.001302533	0	0.005050143	0.02815633	0.0020858	0.231691434	0.00060408	0.039529348	0.015958397	0	0.0637888	0	0.000846	0.00359757	0.004013	1.210585277	1.593975904	0.000796988
	Dallas	0.00504555	0.215103	0.005305276	0.008801423	0.003726366	0	0.008757286	0.048824965	0.0024131	0.268052829	0.000782263	0.051189178	0.009310387	0	0.033672	0	0.008209	0.03490349	0.044002	13.27327198	13.90014687	0.006950073
	Denton	0.00063576	0.02710375	0.001170951	0.001942601	0.000469535	0	0.001874207	0.010449366	0.0007854	0.087247985	0.000226691	0.014834032	0.006095882	0	0.0243999	0	0.00025	0.00106443	0.00114	0.343749313	0.486391477	0.000243196
	Tarrant	0.01557224	0.66387891	0.015705165	0.026054783	0.011500796	0	0.026002176	0.144971319	0.006807	0.756140061	0.002243821	0.146829507	0.022183886	0	0.0770985	0	0.02638	0.11215989	0.141667	42.73394054	44.58397502	0.022291988
	Ellis	0.00350282	0.14933306	0.003532723	0.005860768	0.002586991	0	0.005848935	0.032609879	0.0015312	0.170086302	0.000504725	0.03302786	0.004990048	0	0.0173426	0	0.005934	0.02522927	0.031867	9.612581429	10.02872857	0.005014364
Dallas/ Fort Worth Area	Johnson	0.00033718	0.01437455	0.000621017	0.001030264	0.00024902	0	0.000993991	0.005541852	0.0004166	0.046272226	0.000120226	0.007867272	0.003232969	0	0.0129406	0	0.000133	0.00056452	0.000604	0.182308461	0.257959153	0.00012898
	Kaufman	0.00649275	0.27680029	0.006548174	0.010863384	0.004795187	0	0.01084145	0.060444914	0.0028381	0.31526802	0.000935547	0.061219674	0.009249437	0	0.0321458	0	0.010999	0.04676439	0.059067	17.81765775	18.58901843	0.009294509
	Parker	0.00047595	0.02029086	0.000876616	0.001454302	0.000351511	0	0.0014031	0.007822778	0.000588	0.065317039	0.000169709	0.0111053	0.0045636	0	0.0182667	0	0.000187	0.00079687	0.000853	0.257343333	0.364130484	0.000182065
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.00095027	0.04051214	0.000958382	0.001589951	0.000701818	0	0.001586741	0.008846641	0.0004154	0.046142229	0.000136926	0.008960034	0.001353736	0	0.0047048	0	0.00161	0.00684438	0.008645	2.607769857	2.72066523	0.001360333
	Hood	0.01232788	0.52556467	0.012433111	0.020626462	0.00910469	0	0.020584816	0.114767621	0.0053888	0.598603893	0.001776337	0.116238669	0.017562038	0	0.0610356	0	0.020884	0.08879221	0.112152	33.83064128	35.29523481	0.017647617
	Hunt	0.00635121	0.27076608	0.006405424	0.010626564	0.004690653	0	0.010605108	0.059127221	0.0027763	0.308395213	0.000915153	0.059885092	0.0090478	0	0.031445	0	0.010759	0.04574493	0.05778	17.4292348	18.1837799	0.00909189
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bexar	0.03112811	1.32705982	0.048234164	0.080020213	0.0229895	0	0.084461674	0.470903671	0.0010637	0.118162798	1.065346769	69.71338975	0.043667482	0	0.0043501	0	0.000484	0.00205803	0.002333	0.703626651	72.41522094	0.03620761
San Antonio Area	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.00200761	0.08558885	0.076651484	0.12716439	0.00148271	0	0.134326688	0.748918739	0.0012416	0.137915101	0.00356749	0.233446826	0.001065557	0	0.0018623	0	0.000403	0.00171411	0.001842	0.555554785	1.890302799	0.000945151
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Bastrop	0.00446951	0.19054522	0.170648096	0.283104253	0.003300936	0	0.299049574	1.667307015	0.002764	0.307038406	0.007942252	0.519719311	0.002372235	0	0.0041461	0	0.000898	0.0038161	0.0041	1.236823626	4.20835393	0.002104177
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Hays	0.00246935	0.10527393	0.094281013	0.156411682	0.001823727	0	0.165221279	0.921166998	0.0015271	0.169635013	0.004387998	0.287138645	0.001310631	0	0.0022907	0	0.000496	0.00210835	0.002265	0.683330123	2.325064744	0.001162532
	Travis	0.00050761	0.02164049	0.298194277	0.494702667	0.000374892	0	0.033779905	0.188334901	0.0003331	0.037005635	0.000901861	0.05901531	0.000269863	0	0.0004695	0	0.000103	0.00043726	0.000465	0.140309176	0.941445436	0.000470723
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Rusk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22352453	9.52934121	0.00447587	0.007425444	0.165082827	0	0.007477478	0.041689581	0.001651	0.183399775	0.001597886	0.104561281	0.045960479	0	0.0071176	0	0.001581	0.00672129	0.008136	2.454283451	12.32742203	0.006163711
	San Patricio	0.05533089	2.35887714	0.001107949	0.001838082	0.040864326	0	0.001850962	0.010319769	0.0004087	0.045398473	0.000395538	0.025882924	0.01137698	0	0.0017619	0	0.000391	0.00166378	0.002014	0.607529209	3.051509375	0.001525755
Victoria Area	Victoria	0.02060475	0.87842581	0.002090584	0.003468267	0.015217528	0	0.003408874	0.019005679	0.0011319	0.125739359	0.000524055	0.034292725	0.495811308	0	0.0305841	0	0.00045	0.00191309	0.002128	0.641801811	1.704646743	0.000852323
	Andrews	2.5653E-05	0.00109363	2.58716E-05	4.29209E-05	1.89456E-05	0	4.28342E-05	0.000238816	1.121E-05	0.001245614	3.69632E-06	0.000241877	3.65442E-05	0	0.000127	0	4.35E-05	0.00018476	0.000233	0.070397011	0.073444633	3.67223E-05
	Angelina	0.00032149	0.01370583	0.000324234	0.000537903	0.000237435	0	0.000536817	0.002992944	0.0001405	0.01561057	4.63239E-05	0.003031307	0.000457988	0	0.0015917	0	0.000545	0.00231555	0.002925	0.882245505	0.92043961	0.00046022
	Bosque	0.00093945	0.04005093	0.001730301	0.002870561	0.000693828	0	0.002769496	0.015440919	0.0011606	0.128925436	0.000334979	0.021920093	0.009007821	0	0.0360555	0	0.00037	0.0015729	0.001684	0.507954768	0.718735603	0.000359368
	Brazos	0.00191393	0.08159488	0.003525105	0.00584813	0.00141352	0	0.005642234	0.031457446	0.0023645	0.262656964	0.000682445	0.044657326	0.018351436	0	0.073455	0	0.000754	0.00320443	0.003431	1.034845109	1.464264281	0.000732132
	Calhoun	0.08852525	3.77402557	0.001772635	0.002940792	0.065379841	0	0.0029614	0.016510852	0.0006539	0.072634133	0.000632831	0.041410727	0.01820231	0	0.0028189	0	0.000626	0.00266192	0.003222	0.972000929	4.882184926	0.002441092
	Cameron	0.05467229	2.33079964	0.001094762	0.001816203	0.285623104	0	0.001828931	0.010196934	0.0004038	0.044858099	0.00039083	0.025574842	0.011241561	0	0.0017409	0	0.000387	0.00164397	0.00199	0.600297844	3.015187533	0.001507594
	Cherokee	0.003513	0.14976669	0.003542982	0.005877787	0.002594504	0	0.005865919	0.032704571	0.0015356	0.170580199	0.000506191	0.033123766	0.005004538	0	0.0173929	0	0.005951	0.02530253	0.031959	9.640494492	10.05785004	0.005028925
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.0013551	0.05777086	2.71346E-05	4.50162E-05	0.001000801	0	4.53316E-05	0.00025274	1.001E-05	0.001111846	9.68705E-06	0.000633894	0.000278632	0	4.315E-05	0	9.58E-06	4.0747E-05	4.93E-05	0.014878895	0.074733999	3.7367E-05
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.00362926	0.15472347	0.003660242	0.006072322	0.002680373	0	0.006060061	0.033786984	0.0015864	0.176225836	0.000522944	0.034220053	0.005170172	0	0.0179686	0	0.006148	0.02613996	0.033017	9.959562745	10.39073137	0.005195366
	Fannin	0.00762852	0.32522039	0.007693632	0.012763693	0.005633999	0	0.012737922	0.071018416	0.0033346	0.370417197	0.001099201	0.071928704	0.010867422	0	0.0377689	0	0.012923	0.05494479	0.0694	20.93446343	21.84075662	0.010920378
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.00377443	0.16091241	0.003806652	0.006315215	0.002787588	0	0.006302464	0.035138463	0.0016499	0.183274869	0.000543862	0.035588855	0.005376978	0	0.0186873	0	0.006394	0.02718556	0.034338	10.35794525	10.80636063	0.00540318
	Frio	0.01476384	0.62941483	0.001497957	0.002485103	0.010903753	0	0.002442547	0.013618061	0.0008111	0.090095505	0.000375499	0.024571625	0.355261637	0	0.0219143	0	0.000322	0.00137078	0.001525	0.459867611	1.221423519	0.000610712
	Grimes	0.00055442	0.02363632	0.001021149	0.00169408	0.000409467	0	0.001634436	0.009112561	0.0006849	0.0760862	0.00019769	0.012936288	0.005316025	0	0.0212784	0	0.000218	0.00092825	0.000994	0.29977287	0.424166575	0.000212083
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.239737	10.2205144	0.004800509	0.007964019	0.177056459	0	0.008019827	0.04471337	0.0017708	0.196701954	0.001713782	0.112145221	0.049294041	0	0.0076338	0	0.001695	0.00720879	0.008726	2.632295225	13.22154299	0.006610771
	Howard	0.00058508	0.02494328	0.000590075	0.000978931	0.000432108	0	0.000976955	0.005446867	0.0002558	0.028409721	8.43049E-05	0.005516683	0.000833494	0	0.0028967	0	0.000991	0.00421408	0.005323	1.605601101	1.675110661	0.000837555
	Jack	0.00217756	0.09283408	0.002196145	0.003643393	0.001608224	0	0.003636037	0.02027219	0.0009519	0.105735501	0.000313767	0.020532032	0.003102103	0	0.0107811	0	0.003689	0.01568398	0.01981	5.975737647	6.234438823	0.003117219
	Jones	0.04250012	1.81187357	0.000851025	0.001411846	0.031388236	0	0.00142174	0.007926702	0.0003139	0.034870953	0.000303816	0.019880894	0.008738755	0	0.0013533	0	0.000301	0.00127796	0.001547	0.466648347	2.343890275	0.001171945
Other ERCOT counties	Lamar	0.00107998	0.04604194	0.001089199	0.001806975	0.000797614	0	0.001803327	0.010054184	0.0004721	0.052440518	0.000155616	0.010183054	0.001538517	0	0.005347	0	0.00183	0.00777862	0.009825	2.963723353	3.092028637	0.001546014
	Limestone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Llano	0.00124346	0.05301143	0.047475864	0.078762197	0.000918351	0	0.083198331	0.463860087	0.000769	0.085420897	0.002209607	0.144590674	0.000659977	0	0.0011535	0	0.00025	0.00106167	0.001141	0.344095664	1.170802618	0.000585401
	McLennan	0.02303137	0.9818778	0.023227961	0.038535059	0.017009692	0	0.038457253	0.214412773	0.0100675	1.118332154	0.003318614	0.217161036	0.032809997	0	0.1140288	0	0.039015	0.16588463	0.209526	63.20355475	65.9397582	0.032969879
	Milam	0.00165249	0.07044937	0.001666598	0.002764876	0.001220439	0	0.002759294	0.015384037	0.0007223	0.080239915	0.000238109	0.015581223	0.002354105	0	0.0081815	0	0.002799	0.01190216	0.015033	4.534831492	4.73115307	0.002365577
	Mitchell	0.01696145	0.72310398	0.017106233	0.028379147	0.012526789	0	0.028321847	0.157904303	0.0074142	0.823595799	0.002443993	0.159928261	0.024162925	0	0.0839765	0	0.028733	0.12216575	0.154305	46.54626265	48.56133988	0.02428067
	Nolan	0.00060327	0.02571885	0.000608422	0.001009369	0.000445544	0	0.001007331	0.005616228	0.0002637	0.029293069	8.69262E-05	0.005688215	0.00085941	0	0.0029868	0	0.001022	0.0043451	0.005488	1.655524348	1.727195181	0.000863598
	Palo Pinto	0.00307488	0.13108886	0.00566337	0.009395499	0.002270935	0	0.00906471	0.050538961	0.0037988	0.421979909	0.001096403	0.071745648	0.029483083	0	0.1180115	0	0.001211	0.00514817	0.005512	1.662563361	2.352460405	0.00117623
	Pecos	4.2262E-05	0.00180171	4.26225E-05	7.07105E-05	3.12122E-05	0	7.05678E-05	0.00039344	1.847E-05	0.002052102	6.08954E-06	0.000398483	6.02052E-05	0	0.0002092	0	7.16E-05	0.00030439	0.000384	0.115976384	0.120997225	6.04986E-05
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.00035926	0.01531594	0.000406685	0.000674688	0.000265328	0	0.000358385	0.001998125	0.0015339	0.17038646	0.00035593	0.023291099	0.000370532	0	0.0009089	0	0.093323	0.39678921	0.001655	0.499131599	1.107587115	0.000553794
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tom Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upton	3.2238E-05	0.00137437	3.25131E-05	5.39391E-05	2.38092E-05	0	5.38302E-05	0.000300122	1.409E-05	0.001565375	4.6452E-06	0.000303969	4.59255E-05	0	0.0001596	0	5.46E-05	0.0002322	0.000293	0.088468606	0.092298582	4.61493E-05
	Ward	0.01980763	0.84444256	0.0199767	0.033141236	0.014628815	0	0.033074321	0.184401025	0.0086584	0.961797157	0.002854101	0.186764609	0.028217522	0	0.098068	0	0.033554	0.14266546	0.180198	54.35683759	56.71004964	0.028355025
	Webb	0.01418005	0.60452647	0.000283942	0.000471059	0.010472596	0	0.000474359	0.002644722	0.0001047	0.011634594	0.000101367	0.006633204	0.002915661	0	0.0004515	0	0.0001	0.00042639	0.000516	0.155695896	0.782032337	0.000391016
	Wharton	0.00015439	0.00658198	0.000191235	0.000317258	0.000114024	0	6.43902E-05	0.000358998	0.0011702	0.12998401	0.000265844	0.017396079	0.000106811	0	6.777E-05	0	8.17E-05	0.00034744	0.000112	0.033852246	0.18883802	9.4419E-05
	Wichita	0.00021984	0.00937239	0.000221719	0.000367831	0.000162364	0	0.000367089	0.002046649	9.61E-05	0.010674895	3.16774E-05	0.002072883	0.000313184	0	0.0010884	0	0.000372	0.00158343	0.002	0.603301345	0.629419421	0.00031471
	Wilbarger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wise	0.00291847	0.12442082	0.002955932	0.004903875	0.002155421	0	0.004892446	0.027277115	0.0012878	0.14304743	0.000423725	0.027727436	0.004280539	0	0.0149528	0	0.004924	0.02093718	0.026441	7.975793052	8.324106913	0.004162053
	Young	0.00549666	0.23433469	0.005543579	0.009196767	0.004059529	0	0.009178198	0.051171695	0.0024027	0.26690085	0.000792019	0.051827594	0.007830425	0	0.0272141	0	0.009311	0.03958998	0.050005	15.08414334	15.73716492	0.007868582
	Total	**1.14303735**	**48.7301917**	**1.154658244**	**1.915571682**	**1.089429227**	**0**	**1.180868675**	**6.583760015**	**1.5393506**	**170.9956313**	**1.443965054**	**94.48913869**	**1.48172714**	**0**	**1.2697054**	**0**	**1.151969**	**4.89789857**	**1.517783**	**457.8395882**	**785.4517801**	**0.39272589**

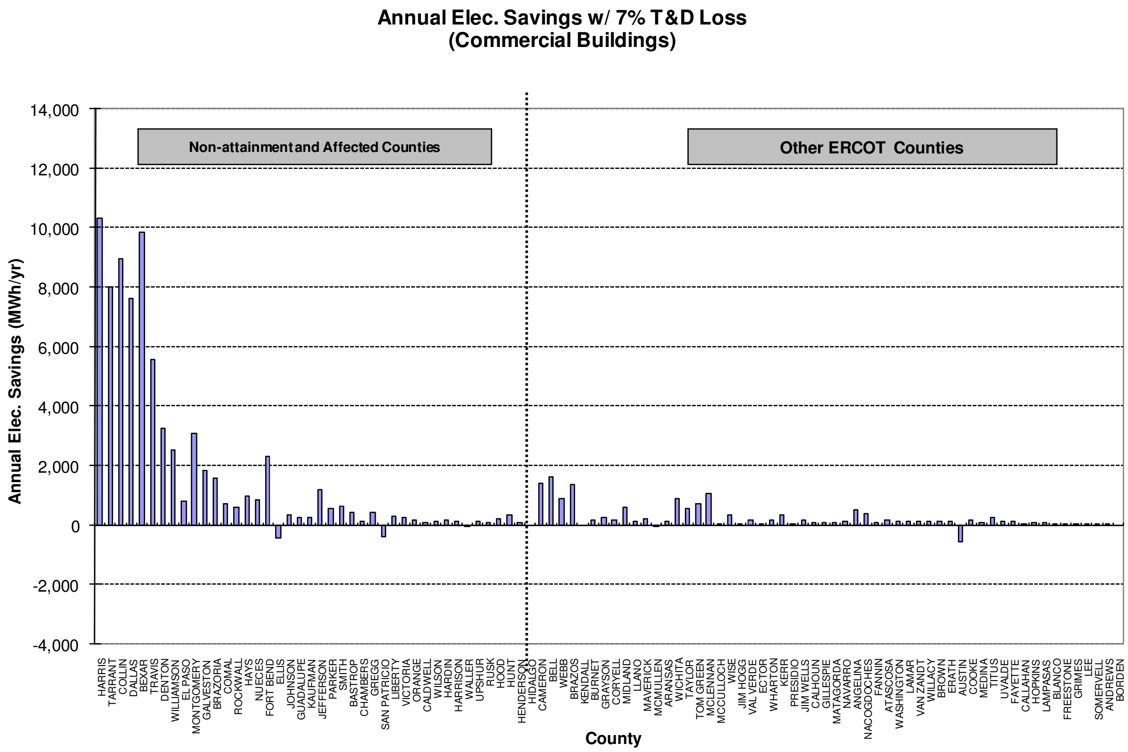
Energy Savings by PCA (MWh)		American Electric Power - West (ERCOT) /PCA		Austin Energy/PCA		Brownsville Public Utils Board/PCA		Lower Colorado River Auhotrity /PCA		Reliant Energy HL&P/PCA		San Antonio Public Service Bd/PCA		South Texas Electric Coop INC/PCA		Texas Municipal Power Pool/PCA		Texas-New Mexico Power Co/PCA		TXU Electric/P CA
		42.63		1.66		0.00		5.58		111.08		65.44		0.00		0.00		4.25		301.65

Table 81: 2007 Annual and OSD NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID (w/7% T&D) (1).

	Electricity Savings and Resultant NOx Reductions (Office)				Total Natural Gas Savings and Resultant NOx Reductions (Office)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
HARRIS	10,298.79	6.04	90.75	0.05	(204,126.40)	(0.94)	3,301.2558	0.0152	5.11	0.0625
TARRANT	8,004.51	2.72	54.41	0.02	(87,019.94)	(0.40)	1,584.3654	0.0073	2.32	0.0296
COLLIN	8,949.71	0.13	49.15	0.00	(58,160.84)	(0.27)	1,029.7451	0.0047	(0.14)	0.0055
DALLAS	7,622.91	0.99	63.37	0.01	(143,133.95)	(0.66)	2,151.2208	0.0099	0.34	0.0168
BEXAR	9,863.19	6.62	57.80	0.04	(61,672.55)	(0.28)	1,498.7534	0.0069	6.33	0.0431
TRAVIS	5,552.40	0.08	32.19	0.00	(27,101.00)	(0.12)	759.6976	0.0035	(0.04)	0.0040
DENTON	3,225.90	0.03	21.01	0.00	(37,014.85)	(0.17)	641.5569	0.0030	(0.14)	0.0032
WILLIAMSON	2,520.52	0.00	13.59	0.00	(17,317.83)	(0.08)	298.3179	0.0014	(0.08)	0.0014
EL PASO	804.91	0.00	10.13	0.00	(30,690.16)	(0.14)	471.6854	0.0022	(0.14)	0.0022
MONTGOMERY	3,087.13	0.00	16.95	0.00	(21,013.40)	(0.10)	364.7824	0.0017	(0.10)	0.0017
GALVESTON	1,819.71	3.35	9.72	0.02	(10,263.07)	(0.05)	197.0388	0.0009	3.30	0.0198
BRAZORIA	1,571.45	0.86	8.57	0.01	(13,243.20)	(0.06)	200.1609	0.0009	0.80	0.0072
COMAL	707.40	0.00	3.76	0.00	(4,442.66)	(0.02)	84.5238	0.0004	(0.02)	0.0004
ROCKWALL	606.57	0.00	3.22	0.00	(4,962.36)	(0.02)	70.9270	0.0003	(0.02)	0.0003
HAYS	955.77	0.20	5.14	0.00	(6,942.16)	(0.03)	112.8519	0.0005	0.17	0.0017
NUECES	826.09	1.01	5.27	0.01	(5,574.38)	(0.03)	164.1283	0.0008	0.99	0.0069
FORT BEND	2,281.73	6.24	14.35	0.03	(24,836.30)	(0.11)	379.1040	0.0017	6.12	0.0358
ELLIS	(455.01)	0.73	0.42	0.01	(10,852.28)	(0.05)	131.8507	0.0006	0.68	0.0056
JOHNSON	314.83	0.02	2.02	0.00	(5,048.08)	(0.02)	64.4031	0.0003	(0.01)	0.0004
GUADALUPE	257.14	0.16	2.17	0.00	(5,366.69)	(0.02)	78.4319	0.0004	0.14	0.0013
KAUFMAN	233.97	1.42	1.95	0.01	(6,577.77)	(0.03)	84.6429	0.0004	1.39	0.0097
JEFFERSON	1,204.72	0.00	6.70	0.00	(2,334.83)	(0.01)	156.3817	0.0007	(0.01)	0.0007
PARKER	547.18	0.01	2.79	0.00	(2,923.16)	(0.01)	59.7842	0.0003	(0.00)	0.0005
SMITH	640.05	0.00	4.40	0.00	(5,867.01)	(0.03)	136.0357	0.0006	(0.03)	0.0006
BASTROP	398.65	0.36	2.22	0.00	(734.10)	(0.00)	63.1031	0.0003	0.36	0.0024
CHAMBERS	129.97	1.93	0.63	0.01	(1,022.69)	(0.00)	13.5306	0.0001	1.92	0.0134
GREGG	397.46	0.00	2.51	0.00	(1,647.32)	(0.01)	76.3831	0.0004	(0.01)	0.0004
SAN PATRICIO	(397.19)	0.22	(0.27)	0.00	(5,627.99)	(0.03)	62.4801	0.0003	0.20	0.0018
LIBERTY	294.64	0.00	1.44	0.00	(2,556.80)	(0.01)	37.0702	0.0002	(0.01)	0.0002
VICTORIA	255.72	0.14	1.40	0.00	(1,255.28)	(0.01)	29.6872	0.0001	0.14	0.0010
ORANGE	171.08	0.00	0.91	0.00	(1,400.56)	(0.01)	24.9033	0.0001	(0.01)	0.0001
CALDWELL	55.86	0.00	0.31	0.00	(584.97)	(0.00)	9.0068	0.0000	(0.00)	0.0000
WILSON	118.24	0.00	0.61	0.00	(516.72)	(0.00)	16.4758	0.0001	(0.00)	0.0001
HARDIN	140.96	0.00	0.69	0.00	(1,100.94)	(0.01)	15.1428	0.0001	(0.01)	0.0001
HARRISON	128.66	0.00	0.68	0.00	(750.51)	(0.00)	17.6722	0.0001	(0.00)	0.0001
WALLER	(78.15)	0.00	0.15	0.00	(2,991.76)	(0.01)	35.5690	0.0002	(0.01)	0.0002
UPSHUR	106.98	0.00	0.54	0.00	(942.75)	(0.00)	14.5831	0.0001	(0.00)	0.0001
RUSK	72.82	0.15	0.38	0.00	(469.64)	(0.00)	6.1384	0.0000	0.15	0.0000
HOOD	199.83	2.80	0.99	0.02	(1,561.19)	(0.01)	25.4444	0.0001	2.80	0.0178
HUNT	339.64	1.38	1.79	0.01	(2,796.69)	(0.01)	47.4485	0.0002	1.37	0.0093
HENDERSON	55.34	0.18	0.46	0.00	(1,388.54)	(0.01)	18.6366	0.0001	0.18	0.0014
HIDALGO	0.00	0.84	0.00	0.01	0.00	0.00	0.0000	0.0000	0.84	0.0066
CAMERON	1,383.19	0.22	9.46	0.00	(14,413.75)	(0.07)	299.1724	0.0014	0.15	0.0029
BELL	1,622.42		9.42		(4,969.43)	(0.02)	235.9629	0.0011	(0.02)	0.0011
WEBB	894.28	0.09	5.63	0.00	(9,020.24)	(0.04)	179.5390	0.0008	0.05	0.0012
BRAZOS	1,370.40	0.11	7.36	0.00	(6,580.23)	(0.03)	179.2775	0.0008	0.08	0.0016
KENDALL	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
BURNET	178.55		0.91		(1,233.18)	(0.01)	22.2760	0.0001	(0.01)	0.0001
GRAYSON	247.06		1.88		(4,201.07)	(0.02)	69.3291	0.0003	(0.02)	0.0003
CORYELL	139.62		0.74		(801.29)	(0.00)	17.0765	0.0001	(0.00)	0.0001
MIDLAND	577.69		3.04		(3,200.79)	(0.01)	65.7640	0.0003	(0.01)	0.0003
LLANO	130.46	0.10	0.71	0.00	217.80	0.00	14.9553	0.0001	0.10	0.0007
MAVERICK	219.46		1.14		(785.55)	(0.00)	25.4120	0.0001	(0.00)	0.0001
MCMULLEN	4.75		0.02		(47.70)	(0.00)	0.7804	0.0000	(0.00)	0.0000
ARANSAS	123.94		0.63		(424.53)	(0.00)	8.3514	0.0000	(0.00)	0.0000
WICHITA	901.81	0.05	5.01	0.00	(1,285.29)	(0.01)	111.0229	0.0005	0.04	0.0008
TAYLOR	524.49	0.00	3.09	0.00	(3,070.37)	(0.01)	70.7090	0.0003	(0.01)	0.0003
TOM GREEN	730.47	0.01	4.04	0.00	(2,739.46)	(0.01)	95.9469	0.0004	(0.01)	0.0004
MCLENNAN	1,061.40	5.49	6.30	0.03	(8,489.66)	(0.04)	176.4540	0.0008	5.45	0.0338
MCCULLOCH	16.95		0.08		(171.01)	(0.00)	2.4209	0.0000	(0.00)	0.0000
WISE	349.16	0.63	1.81	0.00	(1,185.45)	(0.01)	45.0721	0.0002	0.63	0.0044
JIM HOGG	13.20		0.07		(103.68)	(0.00)	1.8182	0.0000	(0.00)	0.0000
VAL VERDE	172.79		0.90		(1,156.08)	(0.01)	22.9625	0.0001	(0.01)	0.0001
ECTOR	30.82	0.79	1.16	0.01	(2,519.76)	(0.01)	63.9875	0.0003	0.78	0.0055
WHARTON	147.82	0.01	0.82	0.00	(1,062.96)	(0.00)	16.5950	0.0001	0.01	0.0002
KERR	316.10		1.64		(1,117.78)	(0.01)	37.2239	0.0002	(0.01)	0.0002
PRESIDIO	18.70	0.00	0.09	0.00	(206.23)	(0.00)	3.0986	0.0000	(0.00)	0.0000
JIM WELLS	164.32		0.85		(675.21)	(0.00)	17.3589	0.0001	(0.00)	0.0001
CALHOUN	62.06	0.37	0.31	0.00	(323.31)	(0.00)	4.3228	0.0000	0.37	0.0025
GILLESPIE	86.42		0.48		(495.54)	(0.00)	10.3212	0.0000	(0.00)	0.0000
MATAGORDA	67.50		0.38		(531.40)	(0.00)	10.9400	0.0001	(0.00)	0.0001
NAVARRO	100.35		0.91		(1,959.49)	(0.01)	33.6536	0.0002	(0.01)	0.0002
ANGELINA	499.18	0.07	2.59	0.00	(2,620.55)	(0.01)	54.7996	0.0003	0.06	0.0007
NACOGDOCHES	373.81		1.97		(2,747.13)	(0.01)	52.3093	0.0002	(0.01)	0.0002
FANNIN	73.64	1.58	0.41	0.01	(697.32)	(0.00)	12.1822	0.0001	1.58	0.0110
ATASCOSA	159.44		0.83		(920.91)	(0.00)	18.8314	0.0001	(0.00)	0.0001
WASHINGTON	133.58		0.78		(1,287.16)	(0.01)	20.7840	0.0001	(0.01)	0.0001
LAMAR	104.65	0.21	0.53	0.00	(880.85)	(0.00)	13.6586	0.0001	0.21	0.0016
VAN ZANDT	112.17		0.54		(1,132.72)	(0.01)	16.1220	0.0001	(0.01)	0.0001
WILLACY	100.65		0.52		(817.28)	(0.00)	10.7807	0.0000	(0.00)	0.0000
BROWN	97.26		0.55		(486.01)	(0.00)	13.5714	0.0001	(0.00)	0.0001
ERATH	104.30		0.54		(682.89)	(0.00)	14.2245	0.0001	(0.00)	0.0001
AUSTIN	(585.80)		(1.53)		(3,546.74)	(0.02)	33.8702	0.0002	(0.02)	0.0002
COOKE	177.31		0.96		(689.61)	(0.00)	20.8299	0.0001	(0.00)	0.0001
MEDINA	79.38		0.39		(817.52)	(0.00)	11.7518	0.0001	(0.00)	0.0001
TITUS	222.57	1.27	1.09	0.00	(1,822.64)	(0.01)	25.6599	0.0001	1.27	0.0001
UVALDE	124.97		0.65		(903.17)	(0.00)	13.4700	0.0001	(0.00)	0.0001
FAYETTE	95.57	0.00	0.51	0.00	(158.86)	(0.00)	11.1575	0.0001	(0.00)	0.0001
CALLAHAN	24.93		0.13		(289.08)	(0.00)	4.1038	0.0000	(0.00)	0.0000
HOPKINS	62.53		0.40		(720.39)	(0.00)	11.9440	0.0001	(0.00)	0.0001
LAMPASAS	64.39		0.33		(226.57)	(0.00)	5.5185	0.0000	(0.00)	0.0000
BLANCO	28.93		0.14		(291.98)	(0.00)	4.0955	0.0000	(0.00)	0.0000
FREESTONE	39.35	0.82	0.19	0.01	(382.92)	(0.00)	5.5469	0.0000	0.82	0.0054
GRIMES	23.20	0.00	0.11	0.00	(233.60)	(0.00)	3.5067	0.0000	(0.00)	0.0002
LEE	24.47		0.12		(248.63)	(0.00)	3.4494	0.0000	(0.00)	0.0000
SOMERVELL	10.96		0.06		(121.36)	(0.00)	1.9248	0.0000	(0.00)	0.0000
ANDREWS	40.17	0.01	0.21	0.00	(143.12)	(0.00)	5.1658	0.0000	0.00	0.0001
BORDEN	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000

Table 82: 2007 Annual and OSD NOx Reductions from IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID (w/7% T&D) (2).

	Electricity Savings and Resultant NOx Reductions (Office)				Total Natural Gas Savings and Resultant NOx Reductions (Office)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
CHEROKEE	75.72	0.78	0.48	0.01	(822.34)	(0.00)	16.5269	0.0001	0.78	0.0051
DIMMIT	9.23		0.04		(93.18)	(0.00)	1.3041	0.0000	(0.00)	0.0000
FALLS	23.44		0.11		(229.58)	(0.00)	3.3721	0.0000	(0.00)	0.0000
COLORADO	53.22		0.27		(321.67)	(0.00)	7.0064	0.0000	(0.00)	0.0000
FRIO	65.60	0.06	0.33	0.00	(414.67)	(0.00)	7.2266	0.0000	0.05	0.0006
MILAM	80.45	0.50	0.39	0.00	(654.82)	(0.00)	8.9810	0.0000	0.50	0.0024
JACKSON	32.09		0.16		(324.82)	(0.00)	4.5895	0.0000	(0.00)	0.0000
ANDERSON	92.40		0.53		(499.19)	(0.00)	11.9092	0.0001	(0.00)	0.0001
HILL	142.38		0.70		(1,127.55)	(0.01)	17.4311	0.0001	(0.01)	0.0001
CULBERSON	6.37		0.03		(61.31)	(0.00)	0.8695	0.0000	(0.00)	0.0000
MASON	3.50		0.02		(35.38)	(0.00)	0.4951	0.0000	(0.00)	0.0000
PECOS	50.94	0.01	0.27	0.00	(63.40)	(0.00)	6.2914	0.0000	0.01	0.0001
RAINS	30.05		0.14		(303.08)	(0.00)	4.3255	0.0000	(0.00)	0.0000
LAVACA	37.34		0.19		(316.30)	(0.00)	5.8265	0.0000	(0.00)	0.0000
PALO PINTO	118.12	0.19	0.59	0.00	(808.30)	(0.00)	12.2382	0.0001	0.19	0.0012
KIMBLE	3.27		0.02		(32.81)	(0.00)	0.5427	0.0000	(0.00)	0.0000
MADISON	25.21		0.12		(257.10)	(0.00)	3.6390	0.0000	(0.00)	0.0000
ARCHER	17.96		0.10		(140.79)	(0.00)	2.9225	0.0000	(0.00)	0.0000
REFUGIO	4.90		0.02		(49.22)	(0.00)	0.7826	0.0000	(0.00)	0.0000
LIMESTONE	54.42	0.06	0.28	0.00	(242.00)	(0.00)	4.8363	0.0000	0.06	0.0000
CLAY	7.28		0.04		(73.41)	(0.00)	1.0564	0.0000	(0.00)	0.0000
BEE	104.73		0.54		(543.23)	(0.00)	13.5032	0.0001	(0.00)	0.0001
MARTIN	0.57		0.00		(5.71)	(0.00)	0.0798	0.0000	(0.00)	0.0000
GONZALES	35.14		0.18		(158.01)	(0.00)	4.0062	0.0000	(0.00)	0.0000
BURLESON	25.94		0.13		(166.10)	(0.00)	3.3862	0.0000	(0.00)	0.0000
KARNES	17.35		0.09		(105.89)	(0.00)	2.2573	0.0000	(0.00)	0.0000
KLEBERG	205.97		1.03		(1,123.47)	(0.01)	18.6038	0.0001	(0.01)	0.0001
BREWSTER	21.80		0.14		(219.38)	(0.00)	5.1826	0.0000	(0.00)	0.0000
WINKLER	2.81		0.01		(28.16)	(0.00)	0.4617	0.0000	(0.00)	0.0000
FRANKLIN	(241.47)		(0.70)		(1,062.32)	(0.00)	8.5213	0.0000	(0.00)	0.0000
YOUNG	80.32	1.40	0.41	0.01	(454.54)	(0.00)	7.7763	0.0000	1.39	0.0079
HOUSTON	107.62		0.55		(344.20)	(0.00)	8.0446	0.0000	(0.00)	0.0000
SCURRY	(4.94)		0.00		(75.06)	(0.00)	1.0685	0.0000	(0.00)	0.0000
BOSQUE	22.05	0.04	0.11	0.00	(222.43)	(0.00)	3.1612	0.0000	0.03	0.0004
COMANCHE	53.74		0.29		30.08	0.00	6.4405	0.0000	0.00	0.0000
BRISCOE	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
CONCHO	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
ZAVALA	27.92		0.14		(172.91)	(0.00)	3.9570	0.0000	(0.00)	0.0000
NOLAN	76.87	0.13	0.39	0.00	(355.33)	(0.00)	7.9234	0.0000	0.12	0.0009
BROOKS	1.96		0.01		(6.94)	(0.00)	0.1526	0.0000	(0.00)	0.0000
ROBERTSON	9.40	0.19	0.06	0.00	(88.48)	(0.00)	1.9850	0.0000	0.19	0.0006
LIVE OAK	6.30		0.03		(63.11)	(0.00)	1.0625	0.0000	(0.00)	0.0000
HAMILTON	31.61		0.16		(87.70)	(0.00)	3.9708	0.0000	(0.00)	0.0000
JONES	16.51	0.18	0.10	0.00	(292.11)	(0.00)	4.2667	0.0000	0.18	0.0012
REAGAN	2.01		0.01		(13.26)	(0.00)	0.3109	0.0000	(0.00)	0.0000
WARD	(1.19)	4.15	(0.00)	0.03	(5.04)	(0.00)	0.0382	0.0000	4.15	0.0284
RED RIVER	40.87	0.00	0.20	0.00	(409.98)	(0.00)	5.9021	0.0000	(0.00)	0.0000
HASKELL	23.54	0.00	0.12	0.00	(100.50)	(0.00)	1.1324	0.0000	(0.00)	0.0000
HOWARD	55.88	0.12	0.29	0.00	(260.16)	(0.00)	7.1505	0.0000	0.12	0.0009
SAN SABA	13.10		0.07		(120.10)	(0.00)	1.8775	0.0000	(0.00)	0.0000
JACK	3.51	0.47	0.02	0.00	(35.30)	(0.00)	0.5599	0.0000	0.47	0.0031
STEPHENS	10.06		0.05		(64.44)	(0.00)	1.3366	0.0000	(0.00)	0.0000
RUNNELS	9.67		0.05		(85.37)	(0.00)	1.1696	0.0000	(0.00)	0.0000
REEVES	21.45		0.11		(77.51)	(0.00)	2.8505	0.0000	(0.00)	0.0000
DE WITT	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
CHILDRESS	7.10		0.06		(148.59)	(0.00)	2.9432	0.0000	(0.00)	0.0000
CROSBY	7.67		0.04		(21.72)	(0.00)	1.0459	0.0000	(0.00)	0.0000
DAWSON	9.20		0.04		(92.82)	(0.00)	1.3196	0.0000	(0.00)	0.0000
MITCHELL	18.59	3.34	0.10	0.02	(17.13)	(0.00)	2.3714	0.0000	3.34	0.0243
WILBARGER	58.43	0.13	0.31	0.00	(141.37)	(0.00)	5.9603	0.0000	0.13	0.0000
COLEMAN	10.76	0.01	0.06	0.00	(58.40)	(0.00)	1.4283	0.0000	0.01	0.0000
UPTON	1.20	0.01	0.01	0.00	5.61	0.00	0.1285	0.0000	0.01	0.0000
COKE	8.95	0.00	0.05	0.00	(108.79)	(0.00)	1.6613	0.0000	(0.00)	0.0000
CROCKETT	7.47	0.00	0.04	0.00	(75.01)	(0.00)	1.2045	0.0000	(0.00)	0.0000
HARDEMAN	0.86	0.00	0.00	0.00	(8.66)	(0.00)	0.1458	0.0000	(0.00)	0.0000
BANDERA	62.03		0.30		(501.42)	(0.00)	8.5550	0.0000	(0.00)	0.0000
BAYLOR	6.42		0.03		5.68	0.00	0.7453	0.0000	0.00	0.0000
COTTLE	1.92		0.01		(19.40)	(0.00)	0.2715	0.0000	(0.00)	0.0000
CRANE	4.27		0.02		(42.91)	(0.00)	0.6732	0.0000	(0.00)	0.0000
DELTA	12.47		0.06		(125.75)	(0.00)	1.7995	0.0000	(0.00)	0.0000
DICKENS	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
DUVAL	28.49		0.14		(271.94)	(0.00)	3.8267	0.0000	(0.00)	0.0000
EASTLAND	72.55		0.36		(395.74)	(0.00)	5.4903	0.0000	(0.00)	0.0000
EDWARDS	0.87		0.00		(8.72)	(0.00)	0.1299	0.0000	(0.00)	0.0000
FISHER	8.67		0.04		(22.68)	(0.00)	1.0766	0.0000	(0.00)	0.0000
FOARD	0.32		0.00		(3.23)	(0.00)	0.0543	0.0000	(0.00)	0.0000
GLASSCOCK	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
GOLIAD	5.51		0.03		(55.64)	(0.00)	0.7787	0.0000	(0.00)	0.0000
HALL	0.68		0.00		(6.85)	(0.00)	0.0958	0.0000	(0.00)	0.0000
HUDSPETH	12.13		0.06		(122.36)	(0.00)	1.7459	0.0000	(0.00)	0.0000
IRION	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
JEFF DAVIS	11.69		0.06		(117.17)	(0.00)	1.9674	0.0000	(0.00)	0.0000
KENEDY	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
KENT	5.26		0.03		24.68	0.00	0.5656	0.0000	0.00	0.0000
KING	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
KINNEY	5.07		0.02		(44.15)	(0.00)	0.6034	0.0000	(0.00)	0.0000
KNOX	3.13		0.02		(31.44)	(0.00)	0.4840	0.0000	(0.00)	0.0000
LA SALLE	8.92		0.05		(7.34)	(0.00)	0.9389	0.0000	(0.00)	0.0000
LEON	20.75		0.10		(210.45)	(0.00)	3.2963	0.0000	(0.00)	0.0000
LOVING	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
MENARD	2.62		0.01		(18.86)	(0.00)	0.3694	0.0000	(0.00)	0.0000
MILLS	13.08		0.06		(131.80)	(0.00)	1.9292	0.0000	(0.00)	0.0000
MONTAGUE	56.19		0.29		(239.42)	(0.00)	5.3501	0.0000	(0.00)	0.0000
MOTLEY	0.80		0.00		(8.10)	(0.00)	0.1134	0.0000	(0.00)	0.0000
REAL	8.59		0.05		17.96	0.00	1.1277	0.0000	0.00	0.0000
SCHLEICHER	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
SHACKELFORD	13.06		0.07		(59.51)	(0.00)	1.7701	0.0000	(0.00)	0.0000
STARR	256.71		1.25		(2,333.60)	(0.01)	35.4507	0.0002	(0.01)	0.0002
STERLING	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
STONEWALL	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
SUTTON	18.30		0.10		(37.84)	(0.00)	2.2499	0.0000	(0.00)	0.0000
TERRELL	0.00		0.00		0.00	0.00	0.0000	0.0000	0.00	0.0000
THROCKMORTON	1.85		0.01		(18.56)	(0.00)	0.3125	0.0000	(0.00)	0.0000
ZAPATA	60.01		0.29		(548.18)	(0.00)	8.2846	0.0000	(0.00)	0.0000
TOTAL	**90,227.41**	**62.23**	**590.76**	**0.39**	**(938,844.21)**	**(4.32)**	**17,124.56**	**0.08**	**57.91**	**0.47**



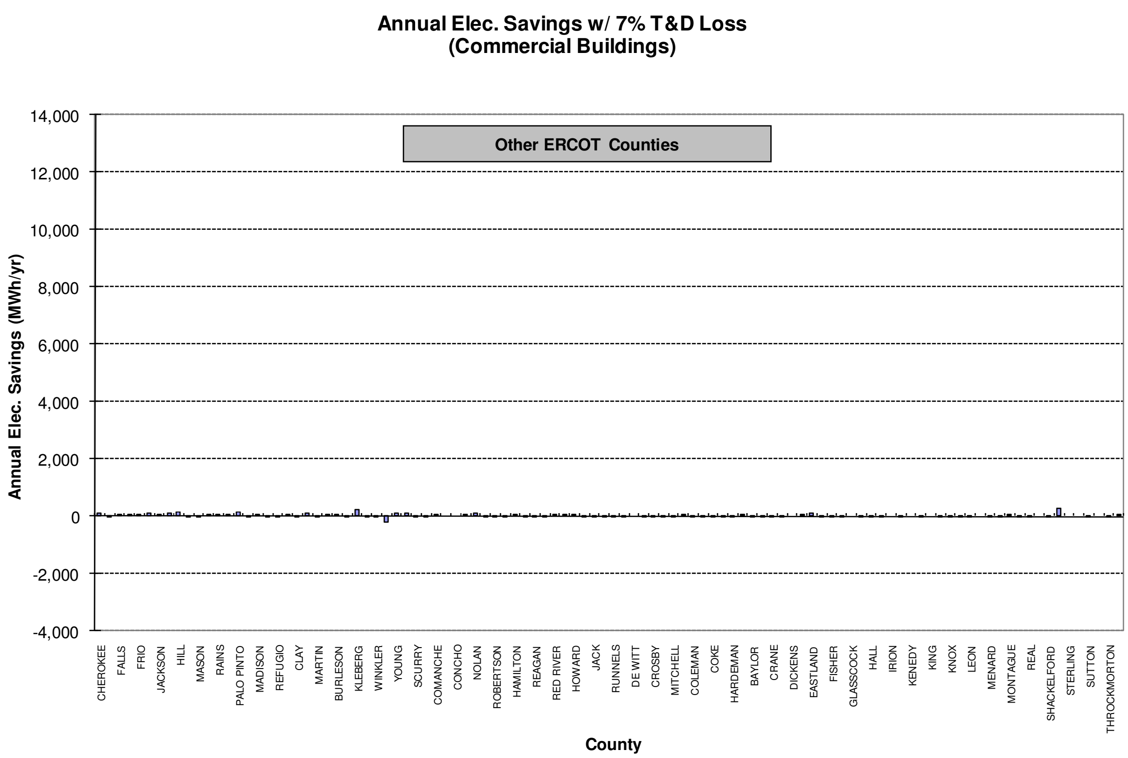
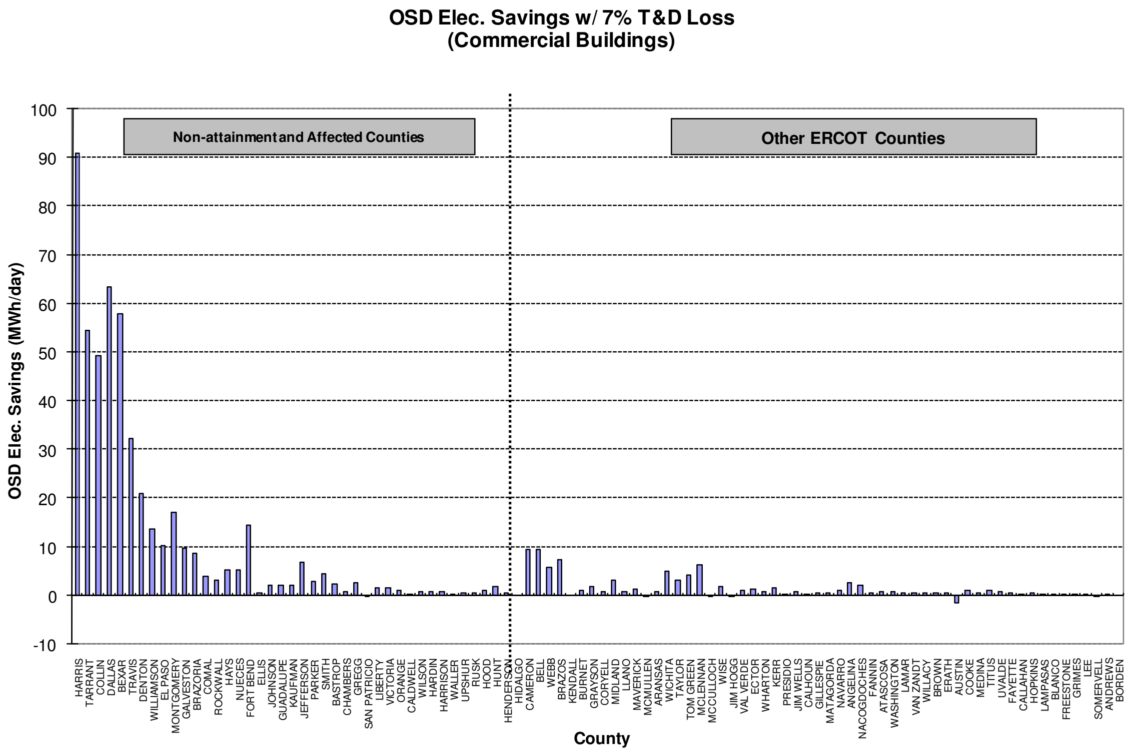


Figure 108: 2007 Annual Electricity Reductions from IECC / IRC by PCA for Commercial Buildings with 7% T&D losses.



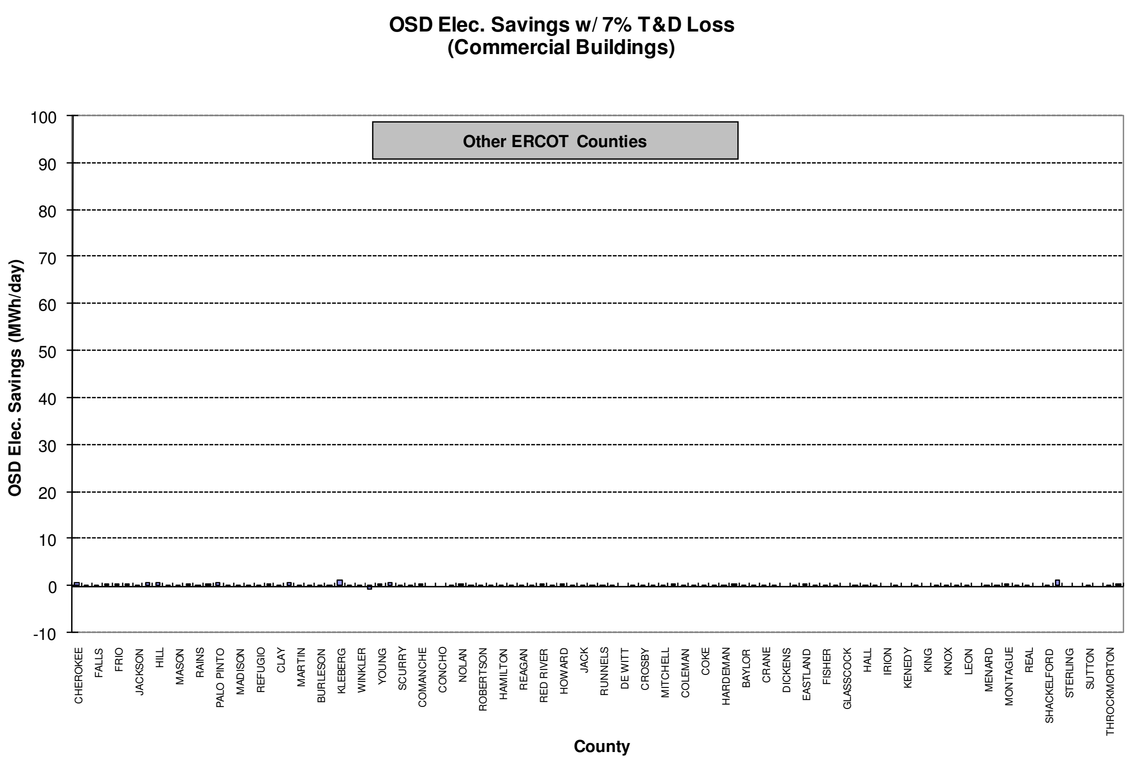
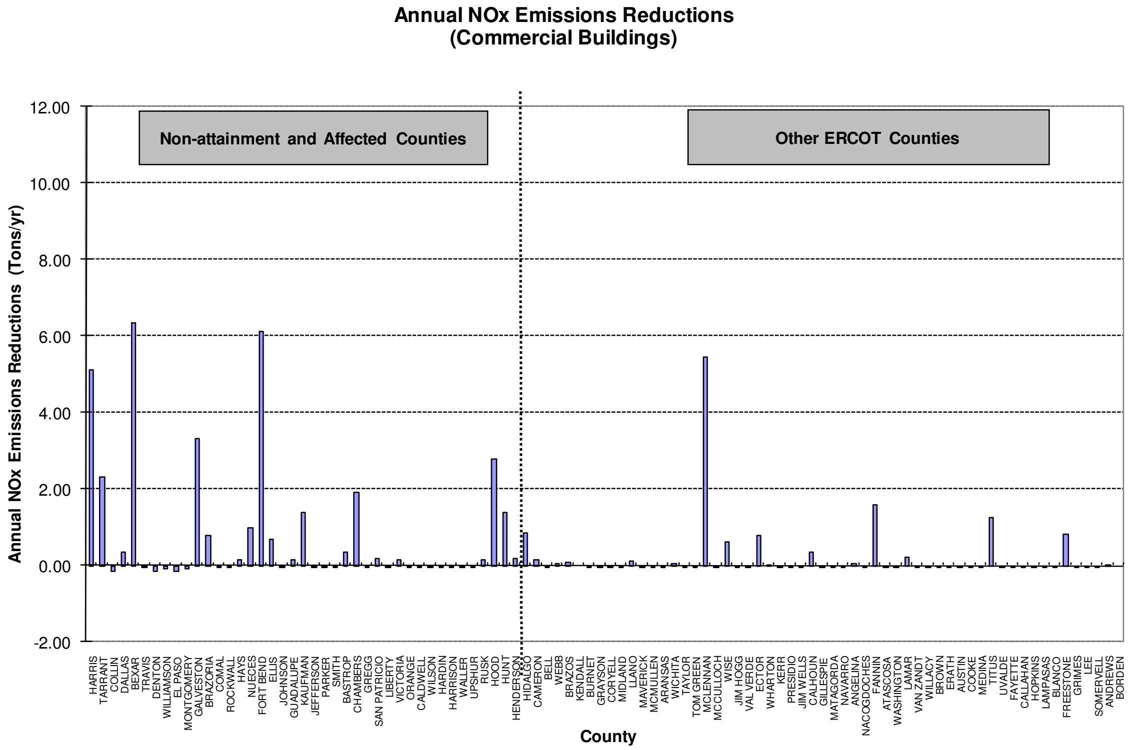


Figure 109: 2007 OSD Electricity Reductions from IECC / IRC by PCA for Commercial Buildings with 7% T&D losses.



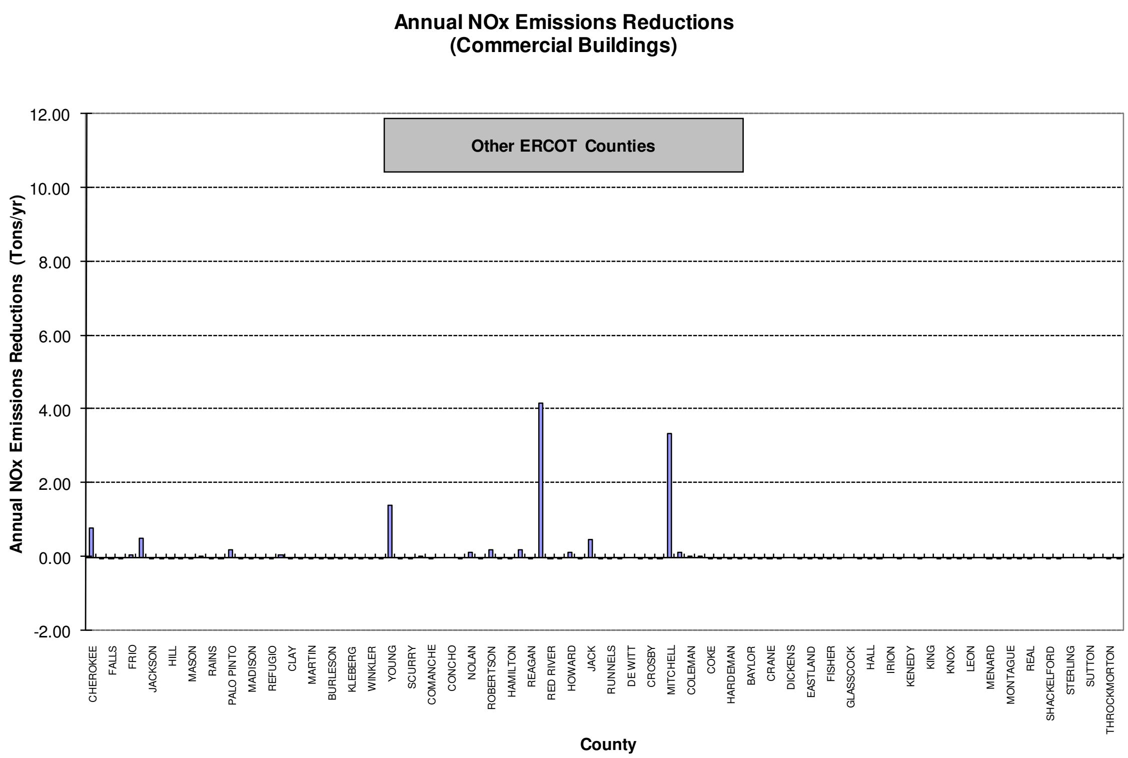
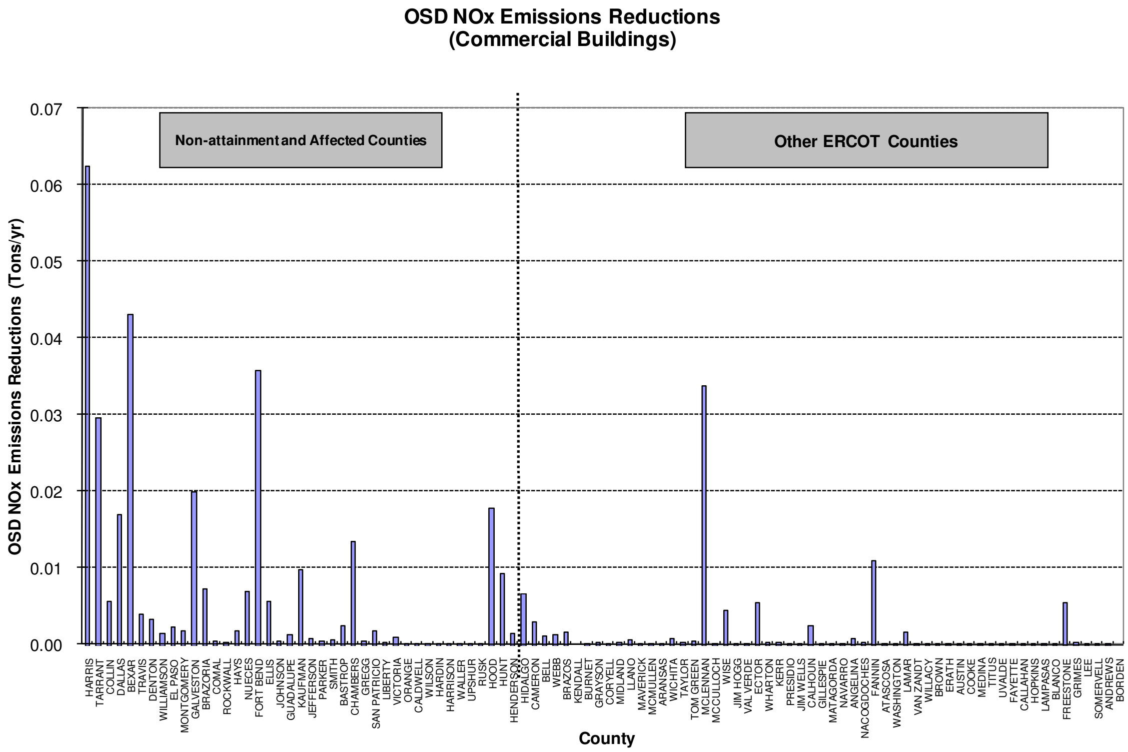


Figure 110: 2007 Annual NOx Reductions from Electricity Savings from the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID with 7% T&D losses.



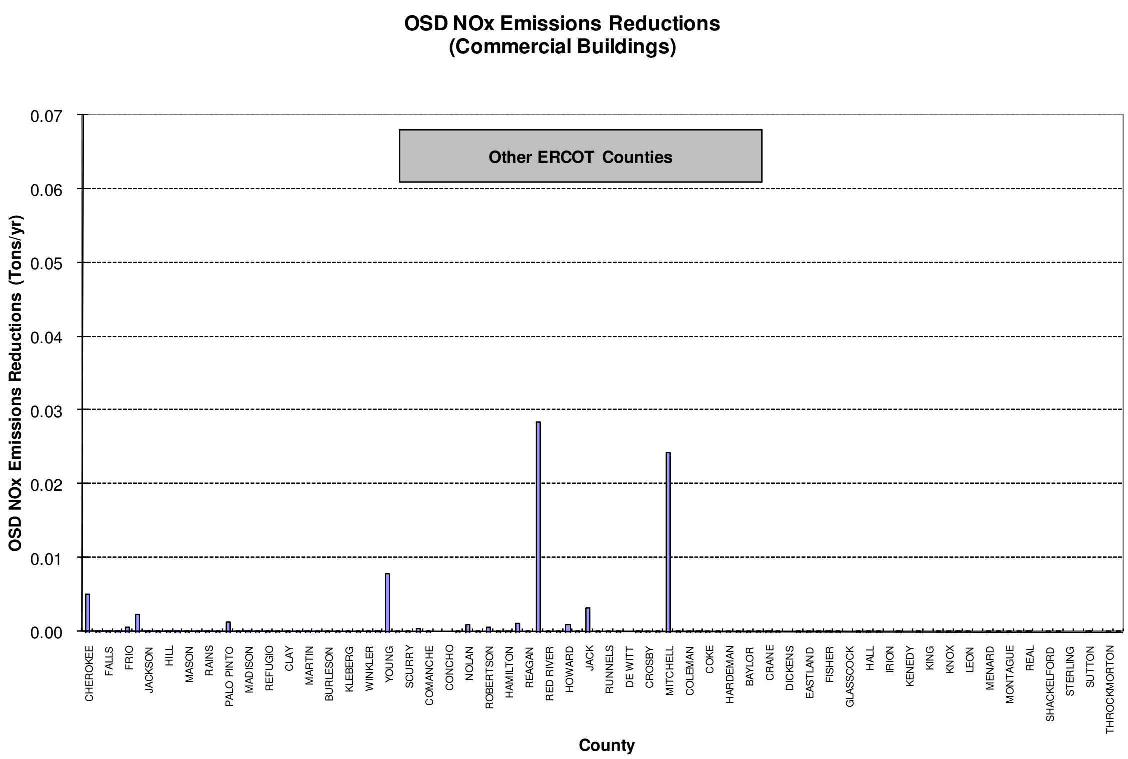


Figure 111: 2007 Annual NOx Reductions from Electricity Savings from the IECC / IRC by PCA for Commercial Buildings by County using 2007 eGRID with 7% T&D losses.

6.1.6 2007 Results for New Residential Construction (Single-family and Multi-family), and Commercial Construction.

6.1.7 2007 Results for New Residential (Single-family and Multi-family), and Commercial Construction using 2007 eGRID.

As shown in Table 84, and Figure 112 through Figure 117 the total annual electricity savings in 2007 were calculated to be 435,751 MWh/yr [35] which includes 325,483MWh/yr (i.e., 74.7%) for single-family residential, 20,041 MWh/yr (i.e., 4.6%) for multi-family residential, and 90,227 MWh/yr (i.e., 20.7%) for new commercial buildings. Natural gas savings were calculated to be 663,897 MBtu (6,638,914 therms) for new residential and commercial construction.

Using the 2007 eGRID, the total NOx reductions from electricity and natural gas savings from new residential (single-family and multi-family) and commercial construction in 2007 were calculated to be 323.34 tons NOx/year which represents 292.80 tons NOx/year from electricity savings and 30.54 tons NOx/year from natural gas savings. On a peak Ozone Season Day (OSD), the NOx reductions in 2007 are calculated to be 1.90 tons of NOx/day which represents 1.74 tons NOx/day from electricity savings and 0.16 tons NOx/day from natural gas savings.

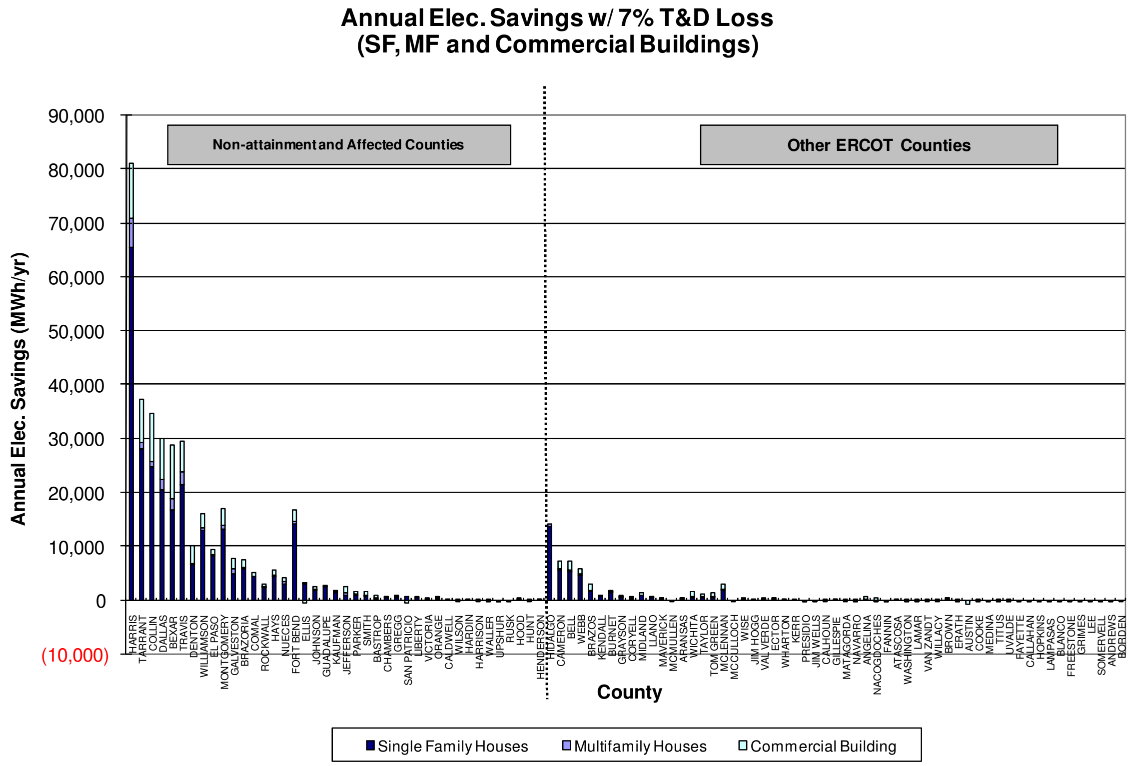
	Electricity Savings and Resultant NOx Reductions (Single Family Houses)				Electricity Savings and Resultant NOx Reductions (Multifamily Houses)				Electricity Savings and Resultant NOx Reductions (Commercial Buildings)				Total Electricity Savings and Resultant NOx Reductions (SF, MF and Commecial Buildings)				Total Natural Gas Savings and Resultant NOx Reductions (SF, MF and Commecial Buildings)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
HARRIS	65,647.69	27.50	400.15	0.19	5,252.69	1.86	30.07	0.01	10,298.79	6.04	90.75	0.05	81,199.17	35.41	520.97	0.25	1,172,500.23	5.39	6,670.85	0.03	40.80	0.28
TARRANT	28,132.62	8.36	180.44	0.07	1,242.32	0.47	9.71	0.00	8,004.51	2.72	54.41	0.02	37,379.64	11.56	244.56	0.09	665,190.83	3.06	3,036.55	0.01	14.62	0.11
COLLIN	24,834.07	0.44	156.77	0.00	902.39	0.03	7.04	0.00	8,949.71	0.13	49.15	0.00	34,686.16	0.60	212.97	0.00	582,947.25	2.68	2,262.66	0.01	3.28	0.01
DALLAS	20,705.44	3.06	132.80	0.02	1,831.31	0.17	14.31	0.00	7,622.91	0.99	63.37	0.01	30,159.66	4.23	210.48	0.03	431,826.80	1.99	3,285.86	0.02	6.22	0.04
BEXAR	16,939.24	14.99	99.40	0.08	1,976.11	1.19	12.63	0.01	9,863.19	6.62	57.80	0.04	28,778.55	22.80	169.83	0.12	351,842.01	1.62	2,564.67	0.01	24.42	0.14
TRAVIS	21,595.62	0.32	126.05	0.00	2,436.77	0.02	14.83	0.00	5,552.40	0.08	32.19	0.00	29,584.79	0.43	173.07	0.00	431,857.94	1.99	1,870.22	0.01	2.42	0.01
DENTON	6,792.04	0.10	43.44	0.00	133.94	0.01	0.87	0.00	3,225.90	0.03	21.01	0.00	10,151.88	0.13	65.32	0.00	155,951.53	0.72	967.79	0.00	0.85	0.01
WILLIAMSON	12,941.58	0.00	75.54	0.00	679.89	0.00	4.14	0.00	2,520.52	0.00	13.59	0.00	16,142.00	0.00	93.26	0.00	241,542.29	1.11	917.55	0.00	1.11	0.00
EL PASO	8,518.39	0.00	38.56	0.00	93.37	0.00	0.51	0.00	804.91	0.00	10.13	0.00	9,416.67	0.00	49.21	0.00	192,800.48	0.89	869.11	0.00	0.89	0.00
MONTGOMERY	13,355.07	0.00	78.55	0.00	577.38	0.00	3.30	0.00	3,087.13	0.00	16.95	0.00	17,019.58	0.00	98.80	0.00	272,228.90	1.25	1,085.35	0.00	1.25	0.00
GALVESTON	4,991.38	14.31	28.76	0.07	1,065.91	0.95	6.11	0.00	1,819.71	3.35	9.72	0.02	7,876.99	18.61	44.58	0.09	106,156.59	0.49	513.73	0.00	19.10	0.10
BRAZORIA	6,005.36	3.70	34.60	0.02	117.78	0.25	0.68	0.00	1,571.45	0.86	8.57	0.01	7,694.59	4.80	43.84	0.03	102,540.13	0.47	511.34	0.00	5.28	0.03
COMAL	4,551.31	0.00	26.71	0.00	0.00	0.00	0.00	0.00	707.40	0.00	3.76	0.00	5,258.71	0.00	30.47	0.00	94,034.72	0.43	334.50	0.00	0.43	0.00
ROCKWALL	2,560.19	0.00	16.37	0.00	12.29	0.00	0.08	0.00	606.57	0.00	3.22	0.00	3,179.05	0.00	19.67	0.00	66,969.74	0.31	191.72	0.00	0.31	0.00
HAYS	4,492.79	0.75	26.22	0.00	207.52	0.04	1.26	0.00	955.77	0.20	5.14	0.00	5,656.08	0.99	32.62	0.01	82,374.07	0.38	326.19	0.00	1.37	0.01
NUECES	3,011.93	4.45	14.73	0.02	544.20	0.20	2.66	0.00	826.09	1.01	5.27	0.01	4,382.22	5.66	22.69	0.03	58,651.54	0.27	333.46	0.00	5.93	0.03
FORT BEND	14,242.77	28.37	83.77	0.13	346.55	1.92	1.98	0.01	2,281.73	6.24	14.35	0.03	16,871.05	36.53	100.10	0.18	282,368.03	1.30	1,131.67	0.01	37.83	0.18
ELLIS	3,470.00	2.26	22.26	0.01	2.61	0.13	0.02	0.00	(455.01)	0.73	0.42	0.01	3,017.59	3.12	22.70	0.02	78,428.06	0.36	300.17	0.00	3.48	0.02
JOHNSON	2,261.96	0.06	14.51	0.00	19.55	0.00	0.15	0.00	314.83	0.02	2.02	0.00	2,596.34	0.08	16.68	0.00	53,565.80	0.25	175.41	0.00	0.33	0.00
GUADALUPE	2,583.42	0.61	15.16	0.00	0.00	0.03	0.00	0.00	257.14	0.16	2.17	0.00	2,840.56	0.81	17.33	0.00	50,531.25	0.23	220.33	0.00	1.04	0.01
KAUFMAN	1,551.18	4.35	9.92	0.03	45.02	0.25	0.29	0.00	233.97	1.42	1.95	0.01	1,830.17	6.01	12.16	0.04	37,799.62	0.17	159.98	0.00	6.19	0.04
JEFFERSON	997.58	0.00	5.65	0.00	414.29	0.00	2.37	0.00	1,204.72	0.00	6.70	0.00	2,616.59	0.00	14.72	0.00	26,414.30	0.12	230.58	0.00	0.12	0.00
PARKER	1,052.05	0.05	6.73	0.00	75.39	0.00	0.49	0.00	547.16	0.01	2.79	0.00	1,674.61	0.06	10.01	0.00	28,112.88	0.13	113.44	0.00	0.19	0.00
SMITH	943.78	0.00	6.52	0.00	33.60	0.00	0.26	0.00	640.05	0.00	4.40	0.00	1,617.42	0.00	11.17	0.00	22,107.86	0.10	191.74	0.00	0.10	0.00
BASTROP	506.65	1.38	2.91	0.01	29.43	0.08	0.18	0.00	398.65	0.36	2.22	0.00	934.73	1.82	5.31	0.01	8,237.18	0.04	85.79	0.00	1.86	0.01
CHAMBERS	676.39	8.77	3.94	0.05	0.00	0.59	0.00	0.00	129.97	1.93	0.63	0.01	806.35	11.29	4.47	0.07	12,861.26	0.06	47.58	0.00	11.35	0.07
GREGG	623.21	0.00	4.22	0.00	89.91	0.00	0.58	0.00	397.46	0.00	2.51	0.00	1,110.57	0.00	7.30	0.00	18,097.81	0.08	114.33	0.00	0.08	0.00
SAN PATRICIO	701.00	0.98	3.43	0.01	0.00	0.05	0.00	0.00	(397.19)	0.22	(0.27)	0.00	303.81	1.25	3.16	0.01	7,060.42	0.03	95.51	0.00	1.28	0.01
LIBERTY	530.07	0.00	3.11	0.00	0.00	0.00	0.00	0.00	294.64	0.00	1.44	0.00	824.71	0.00	4.55	0.00	8,555.55	0.04	64.18	0.00	0.04	0.00
VICTORIA	210.96	0.59	1.29	0.00	0.00	0.03	0.00	0.00	255.72	0.14	1.40	0.00	466.68	0.76	2.69	0.00	3,838.47	0.02	42.92	0.00	0.78	0.00
ORANGE	509.00	0.00	2.89	0.00	4.80	0.00	0.03	0.00	171.08	0.00	0.91	0.00	684.88	0.00	3.83	0.00	9,189.49	0.04	50.72	0.00	0.04	0.00
CALDWELL	186.73	0.00	1.06	0.00	0.00	0.00	0.00	0.00	55.86	0.00	0.31	0.00	242.59	0.00	1.37	0.00	2,629.98	0.01	17.48	0.00	0.01	0.00
WILSON	73.50	0.00	0.43	0.00	0.00	0.00	0.00	0.00	118.24	0.00	0.61	0.00	191.74	0.00	1.04	0.00	1,073.54	0.00	20.51	0.00	0.00	0.00
HARDIN	237.93	0.00	1.35	0.00	0.00	0.00	0.00	0.00	140.96	0.00	0.69	0.00	378.89	0.00	2.04	0.00	3,765.99	0.02	27.08	0.00	0.02	0.00
HARRISON	65.33	0.00	0.45	0.00	0.00	0.00	0.00	0.00	128.66	0.00	0.68	0.00	193.99	0.00	1.13	0.00	1,179.96	0.01	21.19	0.00	0.01	0.00
WALLER	162.05	0.00	0.95	0.00	60.94	0.00	0.35	0.00	(78.15)	0.00	0.15	0.00	144.84	0.00	1.45	0.00	1,682.74	0.01	47.52	0.00	0.01	0.00
UPSHUR	23.97	0.00	0.16	0.00	21.49	0.00	0.14	0.00	106.98	0.00	0.54	0.00	152.44	0.00	0.84	0.00	239.85	0.00	17.12	0.00	0.00	0.00
RUSK	11.25	0.47	0.08	0.00	0.00	0.03	0.00	0.00	72.82	0.15	0.38	0.00	84.08	0.65	0.46	0.00	(112.25)	(0.00)	6.88	0.00	0.65	0.00
HOOD	270.77	8.61	1.74	0.05	0.00	0.49	0.00	0.00	199.83	2.80	0.99	0.02	470.60	11.91	2.73	0.07	5,400.73	0.02	38.56	0.00	11.93	0.07
HUNT	0.00	4.25	0.00	0.03	4.11	0.24	0.03	0.00	339.64	1.38	1.79	0.01	343.74	5.88	1.81	0.04	(2,710.63)	(0.01)	47.68	0.00	5.87	0.04
HENDERSON	218.83	0.56	1.51	0.00	2.60	0.03	0.02	0.00	55.34	0.18	0.46	0.00	276.77	0.78	1.99	0.01	5,365.52	0.02	30.94	0.00	0.80	0.01
HIDALGO	13,870.69	3.68	66.39	0.02	382.98	0.17	1.25	0.00	0.00	0.84	0.00	0.01	14,253.66	4.69	67.64	0.03	241,538.74	1.11	663.13	0.00	5.80	0.03
CAMERON	5,758.25	0.95	27.56	0.01	179.11	0.04	0.58	0.00	1,383.19	0.22	9.46	0.00	7,320.55	1.20	37.61	0.01	86,370.20	0.40	575.91	0.00	1.60	0.01
BELL	5,436.74		32.75		289.29		1.62		1,622.42	0.00	9.42	0.00	7,348.45	0.00	43.78	0.00	139,578.80	0.64	527.05	0.00	0.64	0.00
WEBB	4,754.16	0.39	21.97	0.00	210.99	0.02	1.04	0.00	894.28	0.09	5.63	0.00	5,859.43	0.50	28.64	0.00	68,804.92	0.32	386.05	0.00	0.81	0.00
BRAZOS	1,588.13	0.40	9.34	0.00	260.05	0.02	1.49	0.00	1,370.40	0.11	7.36	0.00	3,218.59	0.54	18.19	0.00	32,281.22	0.15	276.44	0.00	0.69	0.00
KENDALL	1,027.04		6.11		33.78		0.12		0.00	0.00	0.00	0.00	1,060.82	0.00	6.23	0.00	26,404.28	0.12	58.20	0.00	0.12	0.00
BURNET	1,795.31		10.48		9.49		0.06		178.55	0.00	0.91	0.00	1,983.35	0.00	11.44	0.00	32,924.34	0.15	103.17	0.00	0.15	0.00
GRAYSON	755.85		4.78		36.96		0.24		247.06	0.00	1.88	0.00	1,039.87	0.00	6.90	0.00	15,721.15	0.07	107.26	0.00	0.07	0.00
CORYELL	577.41		3.48		29.71		0.17		139.62	0.00	0.74	0.00	746.74	0.00	4.39	0.00	14,510.34	0.07	47.86	0.00	0.07	0.00
MIDLAND	971.90		4.63		0.00		0.00		577.69	0.00	3.04	0.00	1,549.60	0.00	7.67	0.00	28,482.27	0.13	113.20	0.00	0.13	0.00
LLANO	663.09	0.38	3.87	0.00	0.00	0.02	0.00	0.00	130.46	0.10	0.71	0.00	793.55	0.50	4.58	0.00	12,761.21	0.06	44.63	0.00	0.56	0.00
MAVERICK	411.49		1.90		0.00		0.00		219.46	0.00	1.14	0.00	630.95	0.00	3.04	0.00	5,624.81	0.03	42.37	0.00	0.03	0.00
MCMULLEN	0.00		0.00		0.00		0.00		4.75	0.00	0.02	0.00	4.75	0.00	0.02	0.00	(47.70)	(0.00)	0.78	0.00	(0.00)	0.00
ARANSAS	418.21		2.05		7.44		0.04		123.94	0.00	0.63	0.00	549.60	0.00	2.71	0.00	7,278.47	0.03	28.43	0.00	0.03	0.00
WICHITA	678.21	0.14	3.87	0.00	6.36	0.01	0.03	0.00	901.81	0.05	5.01	0.00	1,586.37	0.20	8.91	0.00	25,409.11	0.12	142.30	0.00	0.31	0.00
TAYLOR	702.48	0.00	3.67	0.00	3.38	0.00	0.02	0.00	524.49	0.00	3.09	0.00	1,230.36	0.00	6.77	0.00	19,337.02	0.09	103.48	0.00	0.09	0.00
TOM GREEN	748.40	0.03	3.92	0.00	20.34	0.00	0.13	0.00	730.47	0.01	4.04	0.00	1,499.20	0.04	8.10	0.00	19,656.59	0.09	135.99	0.00	0.13	0.00
MCLENNAN	2,071.76	16.87	12.48	0.10	17.21	0.96	0.10	0.01	1,061.40	5.49	6.30	0.03	3,150.37	23.32	18.87	0.14	42,917.53	0.20	275.36	0.00	23.51	0.14
MCCULLOCH	0.00		0.00		0.00		0.00		16.95	0.00	0.08	0.00	16.95	0.00	0.08	0.00	(171.01)	(0.00)	2.42	0.00	(0.00)	0.00
WISE	248.77	1.95	1.57	0.01	9.20	0.11	0.07	0.00	349.16	0.63	1.81	0.00	607.13	2.69	3.46	0.02	5,240.46	0.02	57.43	0.00	2.72	0.02
JIM HOGG	342.89		4.03		0.00		0.00		13.20	0.00	0.07	0.00	356.08	0.00	4.10	0.00	42,312.58	0.19	69.32	0.00	0.19	0.00
VAL VERDE	284.80		1.67		43.67		0.28		172.79	0.00	0.90	0.00	501.26	0.00	2.86	0.00	6,040.41	0.03	41.60	0.00	0.03	0.00
ECTOR	539.72	2.43	2.57	0.02	0.00	0.14	0.00	0.00	30.82	0.79	1.16	0.01	570.53	3.36	3.73	0.02	15,074.45	0.07	90.33	0.00	3.43	0.02
WHARTON	215.38	0.06	1.32	0.00	6.36	0.00	0.04	0.00	147.82	0.01	0.82	0.00	369.57	0.07	2.17	0.00	4,283.22	0.02	30.52	0.00	0.09	0.00
KERR	0.00		0.00		0.00		0.00		316.10	0.00	1.64	0.00	316.10	0.00	1.64	0.00	(1,117.78)	(0.01)	37.22	0.00	(0.01)	0.00
PRESIDIO	64.90	0.00	0.34	0.00	0.34	0.00	0.00	0.00	18.70	0.00	0.09	0.00	83.94	0.00	0.44	0.00	1,679.15	0.01	6.37	0.00	0.01	0.00
JIM WELLS	0.00		0.00		0.93		0.00		164.32	0.00	0.85	0.00	165.25	0.00	0.86	0.00	(658.63)	(0.00)	17.41	0.00	(0.00)	0.00
CALHOUN	141.62	1.62	0.87	0.01	0.00	0.07	0.00	0.00	62.06	0.37	0.31	0.00	203.68	2.06	1.17	0.01	3,096.27	0.01	13.20	0.00	2.07	0.01
GILLESPIE	171.41		1.00		22.54		0.14		86.42	0.00	0.48	0.00	280.37	0.00	1.62	0.00	3,213.53	0.01	19.32	0.00	0.01	0.00
MATAGORDA	157.85		0.96		0.00		0.00		67.50	0.00	0.38	0.00	225.35	0.00	1.35	0.00	3,280.01	0.02	20.84	0.00	0.02	0.00
NAVARRO	101.64		0.61		14.13		0.08		100.35	0.00	0.91	0.00	216.12	0.00	1.60	0.00	1,087.41	0.01	40.22	0.00	0.01	0.00
ANGELINA	180.04	0.21	1.21	0.00	15.70	0.01	0.12	0.00	499.18	0.07	2.59	0.00	694.92	0.30	3.92	0.00	3,538.17	0.02	67.98	0.00	0.31	0.00
NACOGDOCHES	73.14		0.49		56.20		0.42		373.81	0.00	1.97	0.00	503.15	0.00	2.88	0.00	1,152.50	0.01	61.89	0.00	0.01	0.00
FANNIN	70.26	4.85	0.44	0.03	4.52	0.27	0.03	0.00	73.64	1.58	0.41	0.01	148.41	6.71	0.88	0.05	1,177.27	0.01	15.77	0.00	6.71	0.05
ATASCOSA	218.15		1.28		0.00		0.00		159.44	0.00	0.83	0.00	377.59	0.00	2.10	0.00	3,726.22	0.02	30.84	0.00	0.02	0.00
WASHINGTON	144.05		0.85		15.64		0.09		133.58	0.00	0.78	0.00	293.27	0.00	1.71	0.00	2,072.38	0.01	29.12	0.00	0.01	0.00
LAMAR	105.67	0.65	0.72	0.00	6.24	0.04	0.05	0.00	104.65	0.21	0.53	0.00	216.56	0.90	1.30	0.01	2,442.38	0.01	19.84	0.00	0.91	0.01
VAN ZANDT	107.23		0.68		0.00		0.00		112.17	0.00	0.54	0.00	219.40	0.00	1.22	0.00	1,545.01	0.01	21.17	0.00	0.01	0.00
WILLACY	84.80		0.41		0.00		0.00		100.65	0.00	0.52	0.00	185.45	0.00	0.93	0.00	599.81	0.00	14.67	0.00	0.00	0.00
BROWN	393.59		2.37		10.87		0.06		97.26	0.00	0.55	0.00	501.72	0.00	2.98	0.00	9,580.50	0.04	33.34	0.00	0.04	0.00
ERATH	61.28		0.32		3.38		0.02		104.30	0.00	0.54	0.00	168.96	0.00	0.87	0.00	1,376.87	0.01	17.42	0.00	0.01	0.00
AUSTIN	70.22		0.41		1.96		0.01		(585.80)	0.00	(1.53)	0.00	(513.62)	0.00	(1.11)	0.00	(2,026.94)	(0.01)	37.60	0.00	(0.01)	0.00
COOKE	55.36		0.35		60.77		0.40		177.31	0.00	0.96	0.00	293.45	0.00	1.71	0.00	1,986.42	0.01	26.92	0.00	0.01	0.00
MEDINA	56.96		0.33		0.00		0.00		79.38	0.00	0.39	0.00	136.34	0.00	0.73	0.00	414.94	0.00	14.88	0.00	0.00	0.00
TITUS	54.54	3.92	0.37	0.00	4.60	0.22	0.04	0.00	222.57	1.27	1.09	0.00	281.70	5.41	1.49	0.00	(75.43)	(0.00)	28.95	0.00	5.41	0.00
UVALDE	67.98		0.40		1.36		0.01		124.97	0.00	0.65	0.00	194.32	0.00	1.06	0.00	600.15	0.00	17.30	0.00	0.00	0.00
FAYETTE	36.01	0.00	0.21	0.00	0.00	0.00	0.00	0.00	95.57	0.00	0.51	0.00	131.58	0.00	0.72	0.00	599.66	0.00	13.01	0.00	0.00	0.00
CALLAHAN	26.26		0.14		0.00		0.00		24.93	0.00	0.13	0.00	51.19	0.00	0.26	0.00	544.27	0.00	5.31	0.00	0.00	0.00
HOPKINS	30.02		0.19		0.00		0.00		62.53	0.00	0.40	0.00	92.56	0.00	0.59	0.00	29.37	0.00	13.36	0.00	0.00	0.00
LAMPASAS	58.39		0.35		0.00		0.00		64.39	0.00	0.33	0.00	122.78	0.00	0.68	0.00	1,203.12	0.01	8.24	0.00	0.01	0.00
BLANCO	42.85		0.25		0.00		0.00		28.93	0.00	0.14	0.00	71.78	0.00	0.39	0.00	518.65	0.00	6.01	0.00	0.00	0.00
FREESTONE	56.23	2.53	0.34	0.02	0.00	0.14	0.00	0.00	39.35	0.82	0.19	0.01	95.58	3.49	0.53	0.02	993.81	0.00	8.17	0.00	3.50	0.02
GRIMES	68.42	0.00	0.40	0.00	0.00	0.00	0.00	0.00	23.20	0.00	0.11	0.00	91.62	0.00	0.52	0.00	1,207.59	0.01	7.02	0.00	0.01	0.00
LEE	42.24		0.24		0.00		0.00		24.47	0.00	0.12	0.00	66.70	0.00	0.36	0.00	478.56	0.00	5.37	0.00	0.00	0.00
SOMERVELL	145.80		0.94		0.00		0.00		10.96	0.00	0.06	0.00	156.76	0.00	0.99	0.00	3,627.37	0.02	8.99	0.00	0.02	0.00
ANDREWS	82.72	0.02	0.39	0.00	0.00	0.00	0.00	0.00	40.17	0.01	0.21	0.00	122.89	0.02	0.60	0.00	2,553.31	0.01	9.20	0.00	0.04	0.00
BORDEN	33.78		0.15		0.00		0.00		0.00	0.00	0.00	0.00	33.78	0.00	0.15	0.00	1,724.24	0.01	1.76	0.00	0.01	0.00

Table 83: 2007 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID) (Part 1).

[35] In 2005, it is estimated that there were 128,804 single family residences and 29,972 multi-family residences, which totaled about 350 million sq. ft., and 122 million sq. ft. of commercial building construction.

	Electricity Savings and Resultant NOx Reductions (Single Family Houses)				Electricity Savings and Resultant NOx Reductions (Multifamily Houses)				Electricity Savings and Resultant NOx Reductions (Commercial Buildings)				Total Electricity Savings and Resultant NOx Reductions (SF, MF and Commecial Buildings)				Total Natural Gas Savings and Resultant NOx Reductions (SF, MF and Commecial Buildings)				Total Nox Reductions	
County	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual Electricity Savings per County w/ 7% T&D Loss (MWh/County)	Annual Nox Reductions (Tons)	OSD Electricity Savings per County w/ 7% T&D Loss (MWh/County)	OSD Nox Reductions (Tons)	Total Annual N.G. Savings (Therm/County)	Annual Nox Reductions (Tons)	Total OSD N.G. Savings (Therm/County)	OSD Nox Reductions (Tons)	Annual Nox Reductions (Tons)	OSD Nox Reductions (Tons)
CHEROKEE	35.16	2.41	0.24	0.01	2.20	0.14	0.02	0.00	75.72	0.78	0.48	0.01	113.09	3.33	0.73	0.02	356.32	0.00	19.03	0.00	3.33	0.02
DIMMIT	17.15		0.08		0.00		0.00		9.23	0.00	0.04	0.00	26.38	0.00	0.12	0.00	173.91	0.00	2.01	0.00	0.00	0.00
FALLS	19.46		0.12		0.72		0.00		23.44	0.00	0.11	0.00	43.62	0.00	0.24	0.00	275.61	0.00	4.37	0.00	0.00	0.00
COLORADO	16.21		0.10		0.00		0.00		53.22	0.00	0.27	0.00	69.42	0.00	0.36	0.00	19.66	0.00	7.84	0.00	0.00	0.00
FRIO	36.66	0.23	0.21	0.00	0.00	0.01	0.00	0.00	65.60	0.06	0.33	0.00	102.27	0.30	0.54	0.00	366.36	0.00	9.25	0.00	0.30	0.00
MILAM	25.13	1.54	0.14	0.01	0.00	0.09	0.00	0.00	80.45	0.50	0.39	0.00	105.58	2.13	0.53	0.01	(228.56)	(0.00)	10.09	0.00	2.13	0.01
JACKSON	30.98		0.19		0.00		0.00		32.09	0.00	0.16	0.00	63.07	0.00	0.35	0.00	423.21	0.00	6.53	0.00	0.00	0.00
ANDERSON	25.32		0.17		20.94		0.16		92.40	0.00	0.53	0.00	138.66	0.00	0.86	0.00	892.30	0.00	15.35	0.00	0.00	0.00
HILL	60.55		0.36		6.88		0.04		142.38	0.00	0.70	0.00	209.82	0.00	1.10	0.00	627.03	0.00	21.15	0.00	0.00	0.00
CULBERSON	4.37		0.02		0.00		0.00		6.37	0.00	0.03	0.00	10.74	0.00	0.05	0.00	52.82	0.00	1.07	0.00	0.00	0.00
MASON	27.07		0.16		0.00		0.00		3.50	0.00	0.02	0.00	30.57	0.00	0.17	0.00	476.60	0.00	1.71	0.00	0.00	0.00
PECOS	12.17	0.03	0.06	0.00	8.14	0.00	0.05	0.00	50.94	0.01	0.27	0.00	71.24	0.04	0.39	0.00	612.00	0.00	8.02	0.00	0.04	0.00
RAINS	4.29		0.03		0.00		0.00		30.05	0.00	0.14	0.00	34.34	0.00	0.17	0.00	(195.98)	(0.00)	4.53	0.00	(0.00)	0.00
LAVACA	21.80		0.14		0.00		0.00		37.34	0.00	0.19	0.00	59.14	0.00	0.33	0.00	276.22	0.00	7.21	0.00	0.00	0.00
PALO PINTO	32.83	0.66	0.17	0.00	0.00	0.04	0.00	0.00	118.12	0.19	0.59	0.00	150.95	0.89	0.77	0.01	233.39	0.00	13.75	0.00	0.89	0.01
KIMBLE	2.03		0.01		0.00		0.00		3.27	0.00	0.02	0.00	5.30	0.00	0.03	0.00	25.68	0.00	0.64	0.00	0.00	0.00
MADISON	21.61		0.13		0.00		0.00		25.21	0.00	0.12	0.00	46.82	0.00	0.25	0.00	198.02	0.00	4.75	0.00	0.00	0.00
ARCHER	47.00		0.27		0.00		0.00		17.96	0.00	0.10	0.00	64.97	0.00	0.37	0.00	1,694.76	0.01	5.04	0.00	0.01	0.00
REFUGIO	10.33		0.06		0.00		0.00		4.90	0.00	0.02	0.00	15.22	0.00	0.09	0.00	200.13	0.00	1.43	0.00	0.00	0.00
LIMESTONE	6.49	0.29	0.04	0.00	0.00	0.02	0.00	0.00	54.42	0.06	0.28	0.00	60.91	0.37	0.32	0.00	(83.14)	(0.00)	5.14	0.00	0.37	0.00
CLAY	8.95		0.05		0.00		0.00		7.28	0.00	0.04	0.00	16.23	0.00	0.09	0.00	276.22	0.00	1.46	0.00	0.00	0.00
BEE	23.60		0.14		0.71		0.00		104.73	0.00	0.54	0.00	129.04	0.00	0.68	0.00	42.88	0.00	15.03	0.00	0.00	0.00
MARTIN	0.00		0.00		0.00		0.00		0.57	0.00	0.00	0.00	0.57	0.00	0.00	0.00	(5.71)	(0.00)	0.08	0.00	(0.00)	0.00
GONZALES	14.70		0.09		0.00		0.00		35.14	0.00	0.18	0.00	49.84	0.00	0.26	0.00	160.04	0.00	4.81	0.00	0.00	0.00
BURLESON	25.21		0.15		0.00		0.00		25.94	0.00	0.13	0.00	51.15	0.00	0.28	0.00	364.86	0.00	4.68	0.00	0.00	0.00
KARNES	15.03		0.08		0.00		0.00		17.35	0.00	0.09	0.00	32.38	0.00	0.17	0.00	204.08	0.00	3.06	0.00	0.00	0.00
KLEBERG	79.38		0.38		0.00		0.00		205.97	0.00	1.03	0.00	285.35	0.00	1.41	0.00	239.72	0.00	22.30	0.00	0.00	0.00
BREWSTER	14.20		0.07		0.00		0.00		21.80	0.00	0.14	0.00	36.00	0.00	0.22	0.00	190.09	0.00	5.89	0.00	0.00	0.00
WINKLER	14.48		0.07		0.00		0.00		2.81	0.00	0.01	0.00	17.28	0.00	0.08	0.00	443.72	0.00	1.17	0.00	0.00	0.00
FRANKLIN	8.58		0.05		0.00		0.00		(241.47)	0.00	(0.70)	0.00	(232.89)	0.00	(0.64)	0.00	(848.10)	(0.00)	8.92	0.00	(0.00)	0.00
YOUNG	24.07	4.29	0.13	0.02	0.00	0.24	0.00	0.00	80.32	1.40	0.41	0.01	104.40	5.93	0.53	0.03	309.36	0.00	8.89	0.00	5.93	0.03
HOUSTON	9.85		0.07		0.00		0.00		107.62	0.00	0.55	0.00	117.47	0.00	0.61	0.00	(31.49)	(0.00)	8.69	0.00	(0.00)	0.00
SCURRY	17.78		0.08		0.00		0.00		(4.94)	0.00	0.00	0.00	12.84	0.00	0.08	0.00	832.43	0.00	1.99	0.00	0.00	0.00
BOSQUE	17.30	0.12	0.10	0.00	0.00	0.01	0.00	0.00	22.05	0.04	0.11	0.00	39.35	0.17	0.21	0.00	201.18	0.00	3.97	0.00	0.17	0.00
COMANCHE	2.16		0.01		0.00		0.00		53.74	0.00	0.29	0.00	55.90	0.00	0.30	0.00	83.03	0.00	6.54	0.00	0.00	0.00
BRISCOE	11.88		0.05		0.00		0.00		0.00	0.00	0.00	0.00	11.88	0.00	0.05	0.00	967.61	0.00	0.71	0.00	0.00	0.00
CONCHO	2.03		0.01		0.00		0.00		0.00	0.00	0.00	0.00	2.03	0.00	0.01	0.00	58.50	0.00	0.10	0.00	0.00	0.00
ZAVALA	7.35		0.03		0.00		0.00		27.92	0.00	0.14	0.00	35.27	0.00	0.18	0.00	(58.44)	(0.00)	4.26	0.00	(0.00)	0.00
NOLAN	2.19	0.39	0.01	0.00	0.00	0.02	0.00	0.00	76.87	0.13	0.39	0.00	79.06	0.54	0.40	0.00	(285.88)	(0.00)	8.02	0.00	0.54	0.00
BROOKS	6.06		0.03		0.00		0.00		1.96	0.00	0.01	0.00	8.02	0.00	0.04	0.00	94.28	0.00	0.43	0.00	0.00	0.00
ROBERTSON	41.41	0.53	0.24	0.00	0.00	0.03	0.00	0.00	9.40	0.19	0.06	0.00	50.81	0.75	0.30	0.00	783.82	0.00	4.11	0.00	0.75	0.00
LIVE OAK	31.42		0.15		0.00		0.00		6.30	0.00	0.03	0.00	37.71	0.00	0.19	0.00	505.56	0.00	2.54	0.00	0.00	0.00
HAMILTON	4.33		0.03		0.00		0.00		31.61	0.00	0.16	0.00	35.94	0.00	0.19	0.00	18.21	0.00	4.17	0.00	0.00	0.00
JONES	0.00	0.80	0.00	0.00	3.38	0.04	0.02	0.00	16.51	0.18	0.10	0.00	19.89	1.01	0.12	0.01	(176.83)	(0.00)	4.64	0.00	1.01	0.01
REAGAN	6.00		0.03		0.00		0.00		2.01	0.00	0.01	0.00	8.02	0.00	0.04	0.00	154.90	0.00	0.61	0.00	0.00	0.00
WARD	12.41	12.76	0.06	0.08	0.00	0.72	0.00	0.01	(1.19)	4.15	(0.00)	0.03	11.22	17.64	0.06	0.12	399.43	0.00	0.64	0.00	17.64	0.12
RED RIVER	5.11	0.00	0.03	0.00	0.00	0.00	0.00	0.00	40.87	0.00	0.20	0.00	45.98	0.00	0.23	0.00	(256.19)	(0.00)	6.18	0.00	(0.00)	0.00
HASKELL	4.38	0.00	0.02	0.00	0.85	0.00	0.00	0.00	23.54	0.00	0.12	0.00	28.77	0.00	0.14	0.00	67.21	0.00	1.43	0.00	0.00	0.00
HOWARD	4.14	0.38	0.02	0.00	0.00	0.02	0.00	0.00	55.88	0.12	0.29	0.00	60.01	0.53	0.31	0.00	(125.34)	(0.00)	7.35	0.00	0.53	0.00
SAN SABA	6.77		0.04		0.00		0.00		13.10	0.00	0.07	0.00	19.86	0.00	0.11	0.00	7.89	0.00	2.18	0.00	0.00	0.00
JACK	8.75	1.46	0.05	0.01	0.00	0.08	0.00	0.00	3.51	0.47	0.02	0.00	12.27	2.02	0.06	0.01	242.48	0.00	0.96	0.00	2.02	0.01
STEPHENS	0.00		0.00		0.00		0.00		10.06	0.00	0.05	0.00	10.06	0.00	0.05	0.00	(64.44)	(0.00)	1.34	0.00	(0.00)	0.00
RUNNELS	4.06		0.02		0.00		0.00		9.67	0.00	0.05	0.00	13.73	0.00	0.07	0.00	31.62	0.00	1.37	0.00	0.00	0.00
REEVES	4.14		0.02		0.00		0.00		21.45	0.00	0.11	0.00	25.59	0.00	0.13	0.00	57.31	0.00	3.05	0.00	0.00	0.00
DE WITT	8.85		0.05		0.00		0.00		0.00	0.00	0.00	0.00	8.85	0.00	0.05	0.00	213.72	0.00	0.56	0.00	0.00	0.00
CHILDRESS	5.33		0.02		0.00		0.00		7.10	0.00	0.06	0.00	12.43	0.00	0.09	0.00	123.66	0.00	3.22	0.00	0.00	0.00
CROSBY	24.89		0.11		0.00		0.00		7.67	0.00	0.04	0.00	32.56	0.00	0.15	0.00	1,248.77	0.01	2.34	0.00	0.01	0.00
DAWSON	0.00		0.00		0.00		0.00		9.20	0.00	0.04	0.00	9.20	0.00	0.04	0.00	(92.82)	(0.00)	1.32	0.00	(0.00)	0.00
MITCHELL	0.00	10.28	0.00	0.07	0.00	0.58	0.00	0.00	18.59	3.34	0.10	0.02	18.59	14.20	0.10	0.10	(17.13)	(0.00)	2.37	0.00	14.20	0.10
WILBARGER	8.95	0.56	0.05	0.00	0.00	0.03	0.00	0.00	58.43	0.13	0.31	0.00	67.38	0.71	0.36	0.00	208.26	0.00	6.36	0.00	0.71	0.00
COLEMAN	4.22	0.03	0.02	0.00	0.00	0.00	0.00	0.00	10.76	0.01	0.06	0.00	14.97	0.03	0.08	0.00	61.13	0.00	1.63	0.00	0.03	0.00
UPTON	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.01	0.01	0.00	1.20	0.03	0.01	0.00	5.61	0.00	0.13	0.00	0.03	0.00
COKE	2.10	0.00	0.01	0.00	0.00	0.00	0.00	0.00	8.95	0.00	0.05	0.00	11.05	0.00	0.06	0.00	(38.94)	(0.00)	1.76	0.00	(0.00)	0.00
CROCKETT	38.54	0.00	0.20	0.00	0.00	0.00	0.00	0.00	7.47	0.00	0.04	0.00	46.00	0.00	0.24	0.00	1,036.41	0.00	3.12	0.00	0.00	0.00
HARDEMAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.86	0.00	0.00	0.00	(8.66)	(0.00)	0.15	0.00	(0.00)	0.00
BANDERA	3.76		0.02		0.00		0.00		62.03	0.00	0.30	0.00	65.79	0.00	0.33	0.00	(408.71)	(0.00)	8.76	0.00	(0.00)	0.00
BAYLOR	0.00		0.00		0.00		0.00		6.42	0.00	0.03	0.00	6.42	0.00	0.03	0.00	5.68	0.00	0.75	0.00	0.00	0.00
COTTLE	0.00		0.00		0.00		0.00		1.92	0.00	0.01	0.00	1.92	0.00	0.01	0.00	(19.40)	(0.00)	0.27	0.00	(0.00)	0.00
CRANE	38.02		0.19		0.00		0.00		4.27	0.00	0.02	0.00	42.29	0.00	0.21	0.00	1,022.16	0.00	2.59	0.00	0.00	0.00
DELTA	23.59		0.15		0.00		0.00		12.47	0.00	0.06	0.00	36.06	0.00	0.21	0.00	463.35	0.00	2.91	0.00	0.00	0.00
DICKENS	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DUVAL	0.00		0.00		0.00		0.00		28.49	0.00	0.14	0.00	28.49	0.00	0.14	0.00	(271.94)	(0.00)	3.83	0.00	(0.00)	0.00
EASTLAND	2.19		0.01		0.00		0.00		72.55	0.00	0.36	0.00	74.74	0.00	0.37	0.00	(326.30)	(0.00)	5.59	0.00	(0.00)	0.00
EDWARDS	0.00		0.00		0.00		0.00		0.87	0.00	0.00	0.00	0.87	0.00	0.00	0.00	(8.72)	(0.00)	0.13	0.00	(0.00)	0.00
FISHER	0.00		0.00		0.00		0.00		8.67	0.00	0.04	0.00	8.67	0.00	0.04	0.00	(22.68)	(0.00)	1.08	0.00	(0.00)	0.00
FOARD	0.00		0.00		0.00		0.00		0.32	0.00	0.00	0.00	0.32	0.00	0.00	0.00	(3.23)	(0.00)	0.05	0.00	(0.00)	0.00
GLASSCOCK	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GOLIAD	0.00		0.00		0.00		0.00		5.51	0.00	0.03	0.00	5.51	0.00	0.03	0.00	(55.64)	(0.00)	0.78	0.00	(0.00)	0.00
HALL	0.00		0.00		0.00		0.00		0.68	0.00	0.00	0.00	0.68	0.00	0.00	0.00	(6.85)	(0.00)	0.10	0.00	(0.00)	0.00
HUDSPETH	277.56		1.26		2.44		0.01		12.13	0.00	0.06	0.00	292.13	0.00	1.32	0.00	7,205.62	0.03	14.80	0.00	0.03	0.00
IRION	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
JEFF DAVIS	0.00		0.00		0.00		0.00		11.69	0.00	0.06	0.00	11.69	0.00	0.06	0.00	(117.17)	(0.00)	1.97	0.00	(0.00)	0.00
KENEDY	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KENT	0.00		0.00		0.00		0.00		5.26	0.00	0.03	0.00	5.26	0.00	0.03	0.00	24.68	0.00	0.57	0.00	0.00	0.00
KING	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
KINNEY	0.00		0.00		0.00		0.00		5.07	0.00	0.02	0.00	5.07	0.00	0.02	0.00	(44.15)	(0.00)	0.60	0.00	(0.00)	0.00
KNOX	0.00		0.00		0.00		0.00		3.13	0.00	0.02	0.00	3.13	0.00	0.02	0.00	(31.44)	(0.00)	0.48	0.00	(0.00)	0.00
LA SALLE	95.52		0.44		4.65		0.02		8.92	0.00	0.05	0.00	109.09	0.00	0.51	0.00	1,563.65	0.01	5.11	0.00	0.01	0.00
LEON	0.00		0.00		0.00		0.00		20.75	0.00	0.10	0.00	20.75	0.00	0.10	0.00	(210.45)	(0.00)	3.30	0.00	(0.00)	0.00
LOVING	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MENARD	0.00		0.00		0.00		0.00		2.62	0.00	0.01	0.00	2.62	0.00	0.01	0.00	(18.86)	(0.00)	0.37	0.00	(0.00)	0.00
MILLS	0.00		0.00		0.00		0.00		13.08	0.00	0.06	0.00	13.08	0.00	0.06	0.00	(131.80)	(0.00)	1.93	0.00	(0.00)	0.00
MONTAGUE	2.13		0.01		0.00		0.00		56.19	0.00	0.29	0.00	58.32	0.00	0.30	0.00	(185.48)	(0.00)	5.45	0.00	(0.00)	0.00
MOTLEY	0.00		0.00		0.00		0.00		0.80	0.00	0.00	0.00	0.80	0.00	0.00	0.00	(8.10)	(0.00)	0.11	0.00	(0.00)	0.00
REAL	0.00		0.00		0.00		0.00		8.59	0.00	0.05	0.00	8.59	0.00	0.05	0.00	17.96	0.00	1.13	0.00	0.00	0.00
SCHLEICHER	4.06		0.02		0.00		0.00		0.00	0.00	0.00	0.00	4.06	0.00	0.02	0.00	116.99	0.00	0.20	0.00	0.00	0.00
SHACKELFORD	0.00		0.00		0.00		0.00		13.06	0.00	0.07	0.00	13.06	0.00	0.07	0.00	(59.51)	(0.00)	1.77	0.00	(0.00)	0.00
STARR	0.00		0.00		0.00		0.00		256.71	0.00	1.25	0.00	256.71	0.00	1.25	0.00	(2,333.60)	(0.01)	35.45	0.00	(0.01)	0.00
STERLING	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STONEWALL	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUTTON	0.00		0.00		0.00		0.00		18.30	0.00	0.10	0.00	18.30	0.00	0.10	0.00	(37.84)	(0.00)	2.25	0.00	(0.00)	0.00
TERRELL	0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
THROCKMORTON	0.00		0.00		0.00		0.00		1.85	0.00	0.01	0.00	1.85	0.00	0.01	0.00	(18.56)	(0.00)	0.31	0.00	(0.00)	0.00
ZAPATA	0.00		0.00		0.00		0.00		60.01	0.00	0.29	0.00	60.01	0.00	0.29	0.00	(548.18)	(0.00)	8.28	0.00	(0.00)	0.00
TOTAL	325,483.35	217.18	1,929.06	1.27	20,040.57	13.39	124.15	0.08	90,227.41	62.23	590.76	0.39	435,751.34	292.80	2,643.97	1.74	6,638,973.88	30.54	34,077.21	0.16	323.34	1.90

Table 84: 2007 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID) (Part 2).



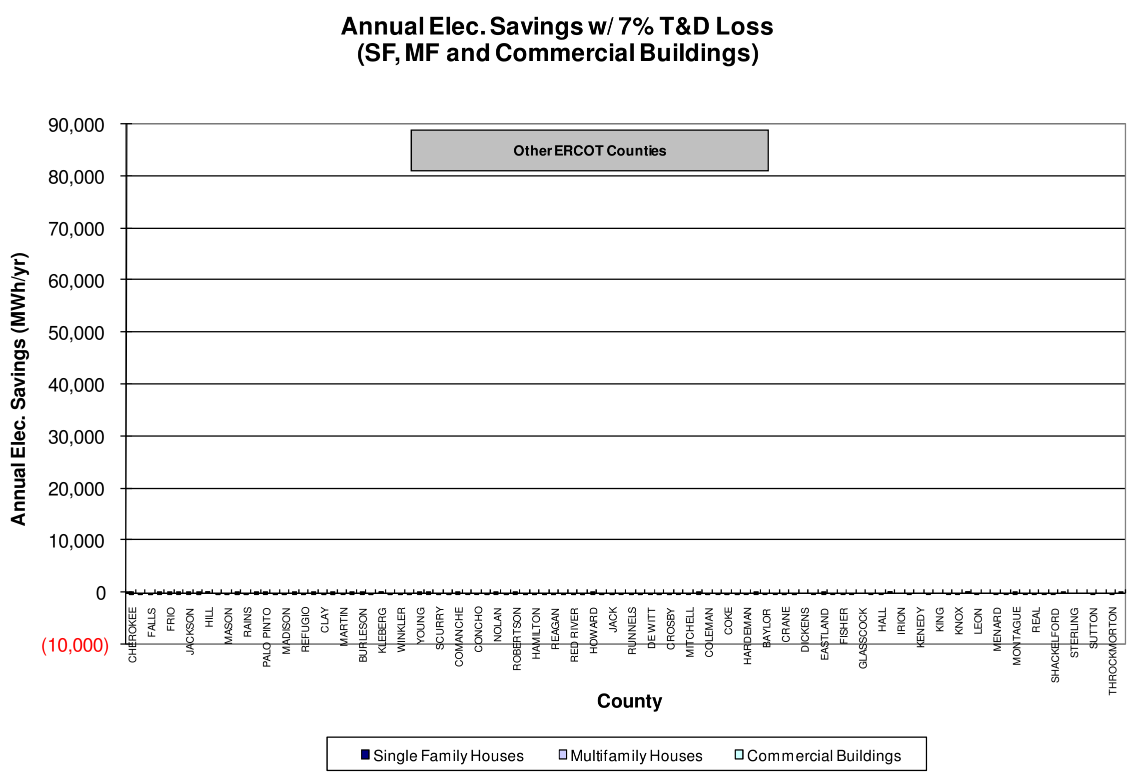
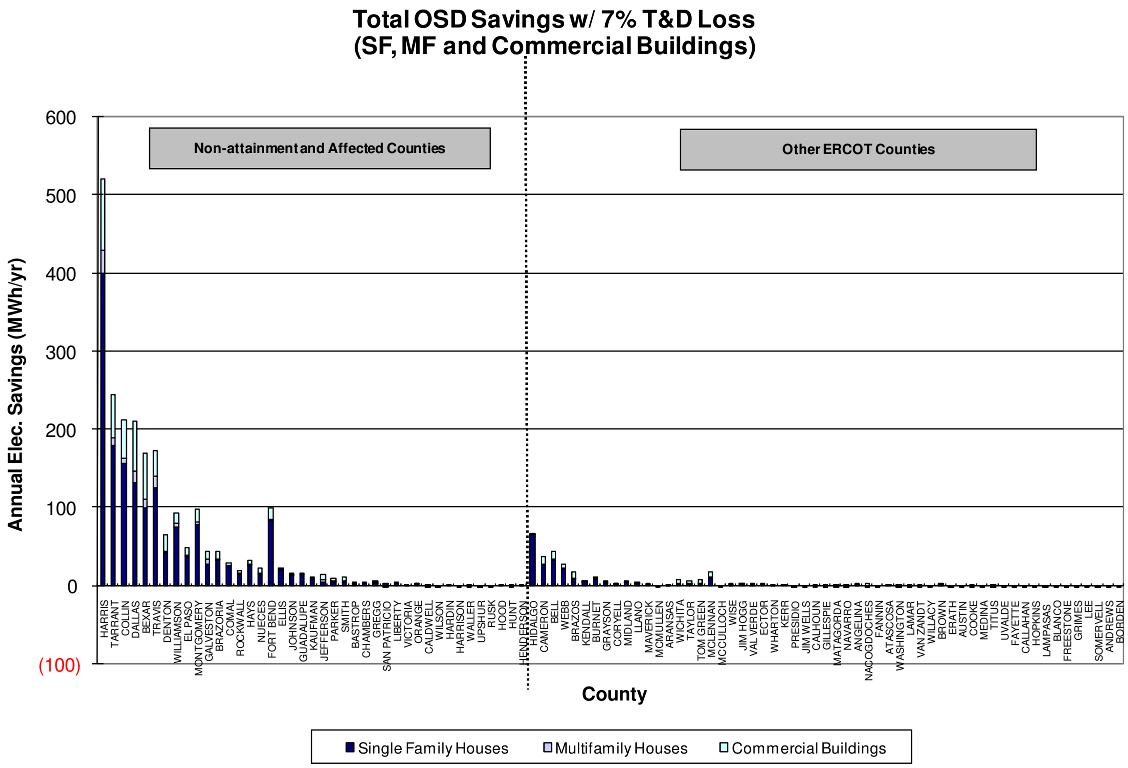


Figure 112: 2007 Annual Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences and for Commercial Buildings by County.



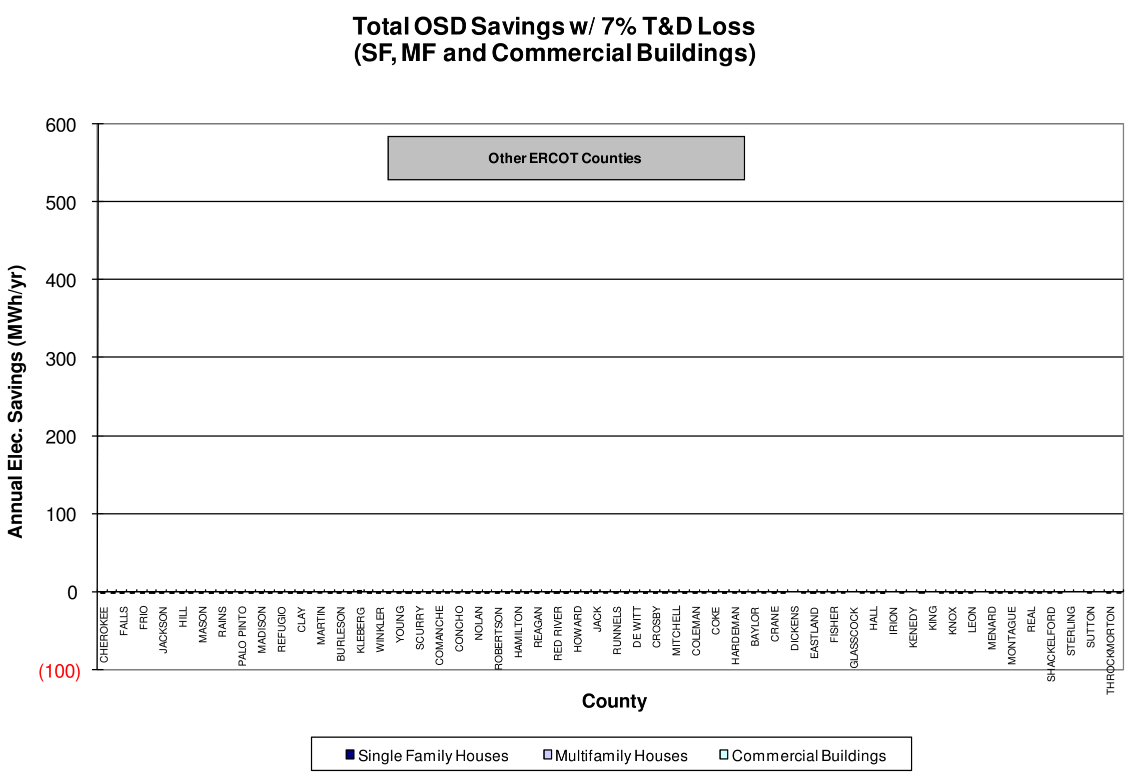
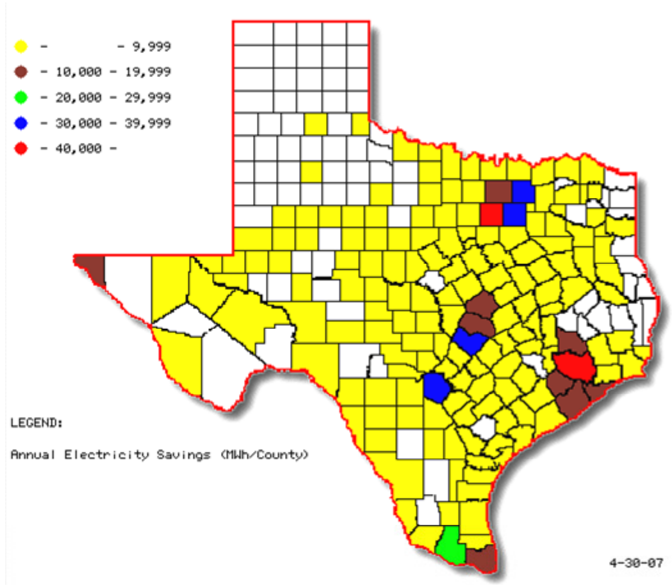


Figure 113: 2007 OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences and for Commercial Buildings by County.



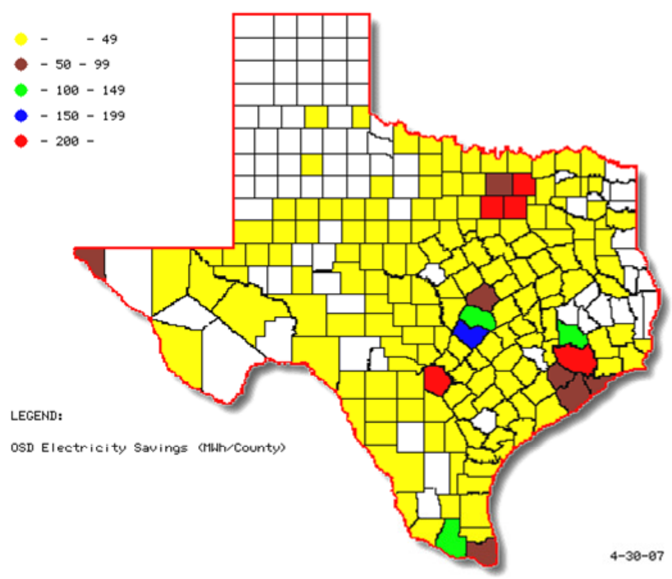
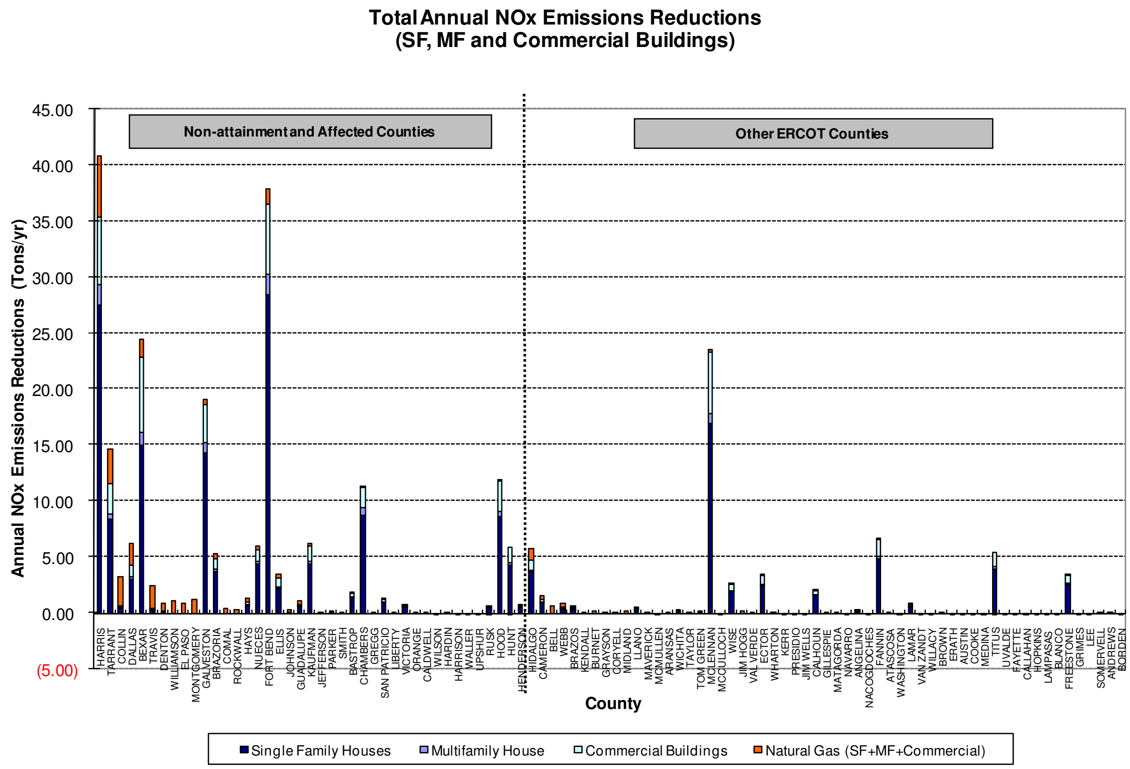


Figure 114: 2007 Annual and OSD Electricity Reductions from IECC / IRC by PCA for Single-family and Multi-family Residences and for Commercial Buildings by County.



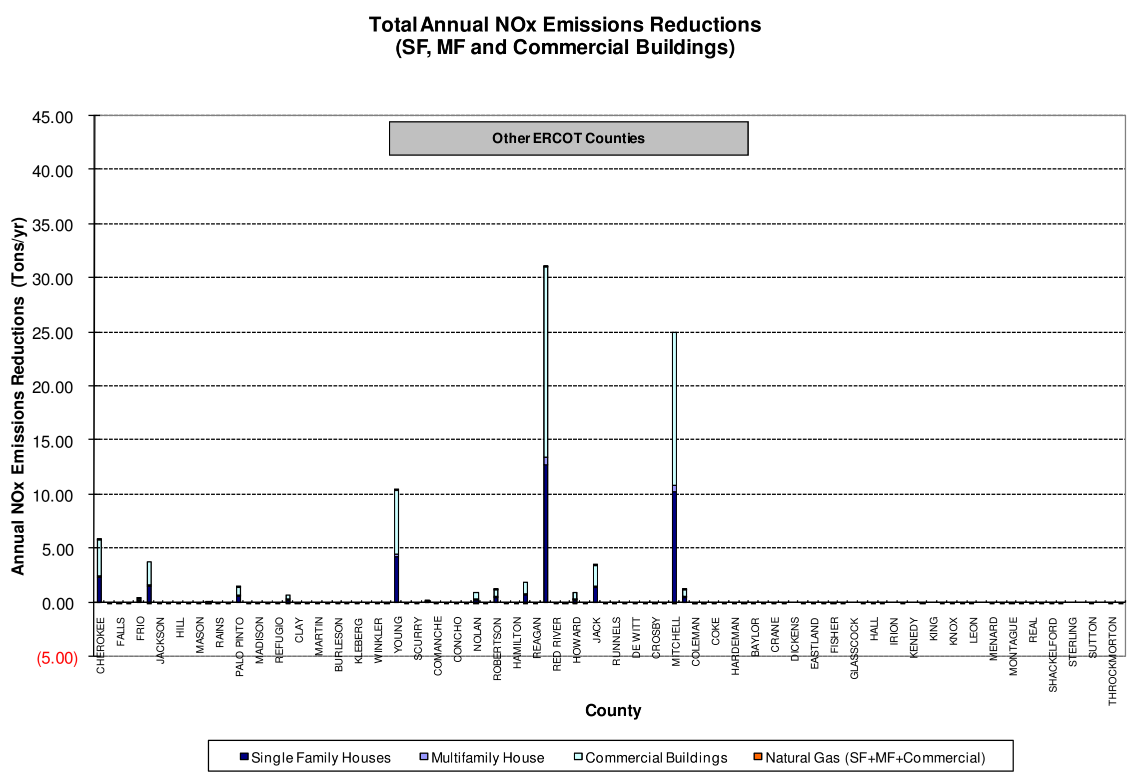
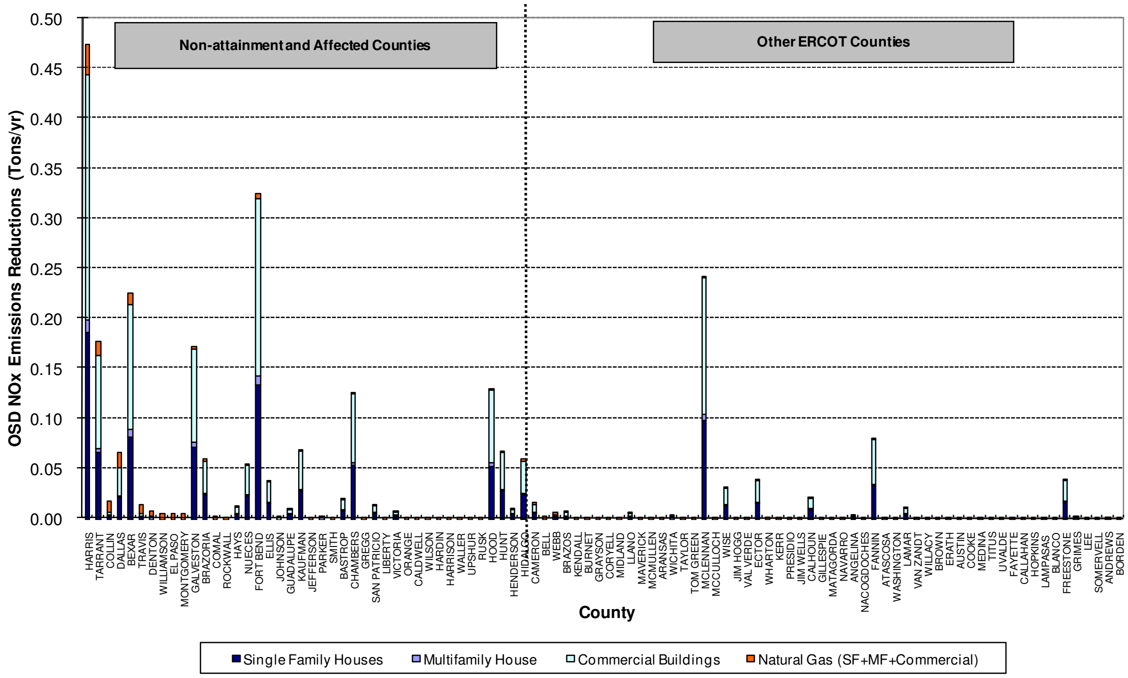


Figure 115: 2007 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 1999 eGRID).

**Total OSD NOx Emissions Reductions
(SF, MF and Commercial Buildings)**



**Total OSD NOx Emissions Reductions
(SF, MF and Commercial Buildings)**

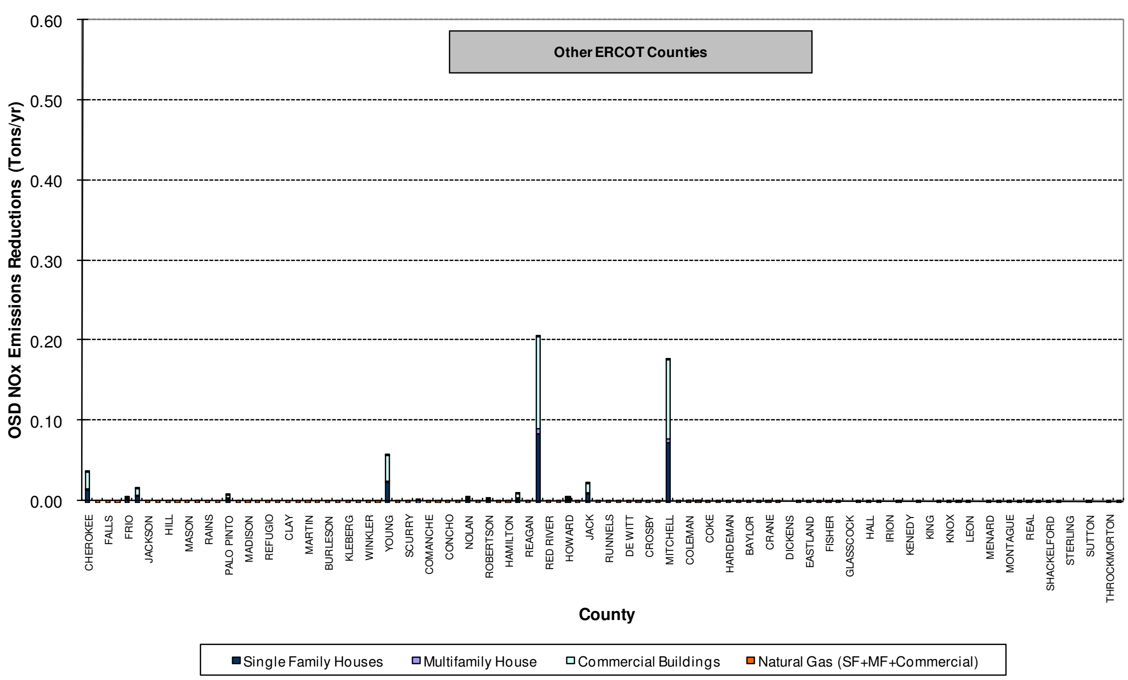
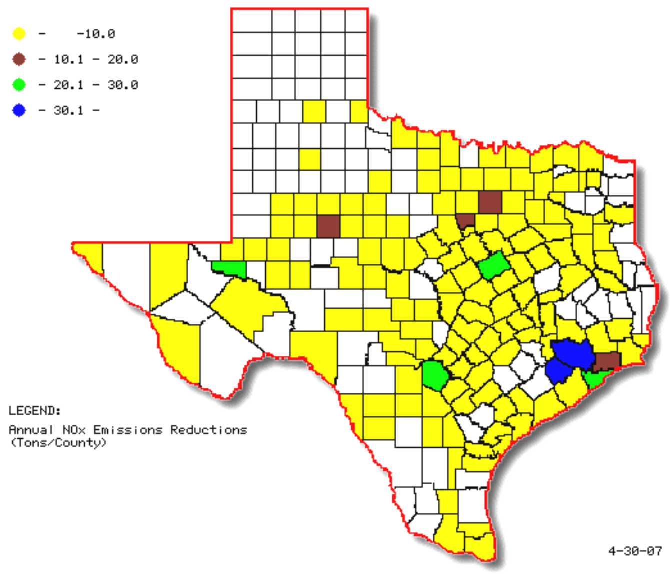


Figure 116: 2007 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID).



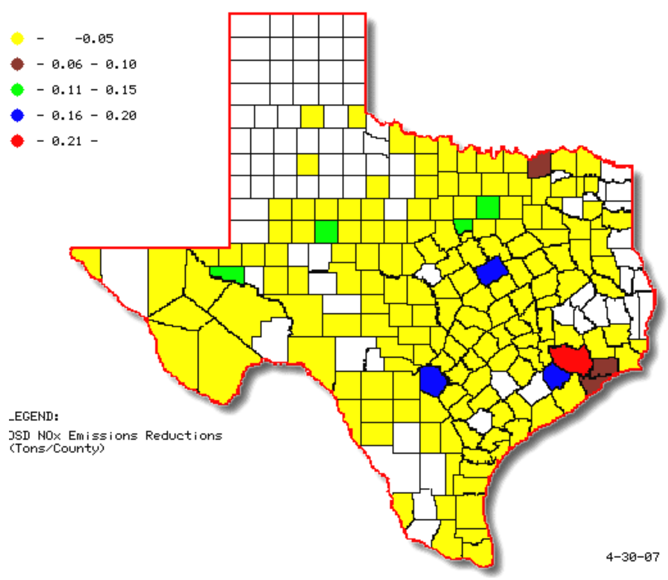
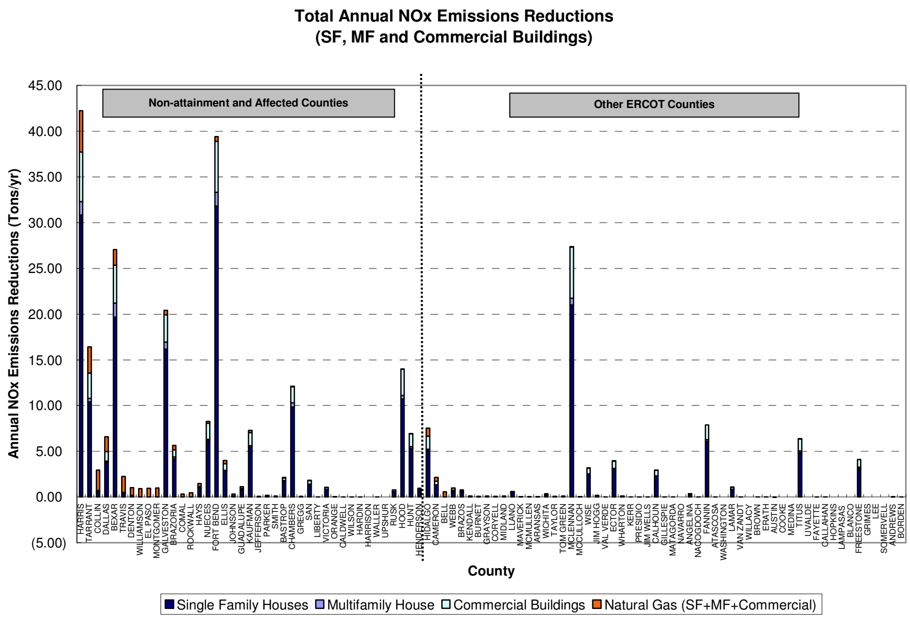


Figure 117: 2007 Annual and OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County (using 2007 eGRID).

7 COMPARISON OF 2007 EMISSIONS REDUCTIONS VS 2006 EMISSIONS REDUCTIONS

In this section a side-by-side comparison is presented of the 2007 emissions reductions calculations versus the 2006 emissions reductions for both the annual and Ozone Season Day (OSD). In Figure 118 and Figure 119 the annual and OSD NOx reductions are presented for the 2006 analysis, respectively. These can be compared to the values presented in Figure 120 and Figure 121 for the 2007 analysis. Table 85 presents a summary of the comparisons for the total values shown by county in Figure 118 through Figure 121.



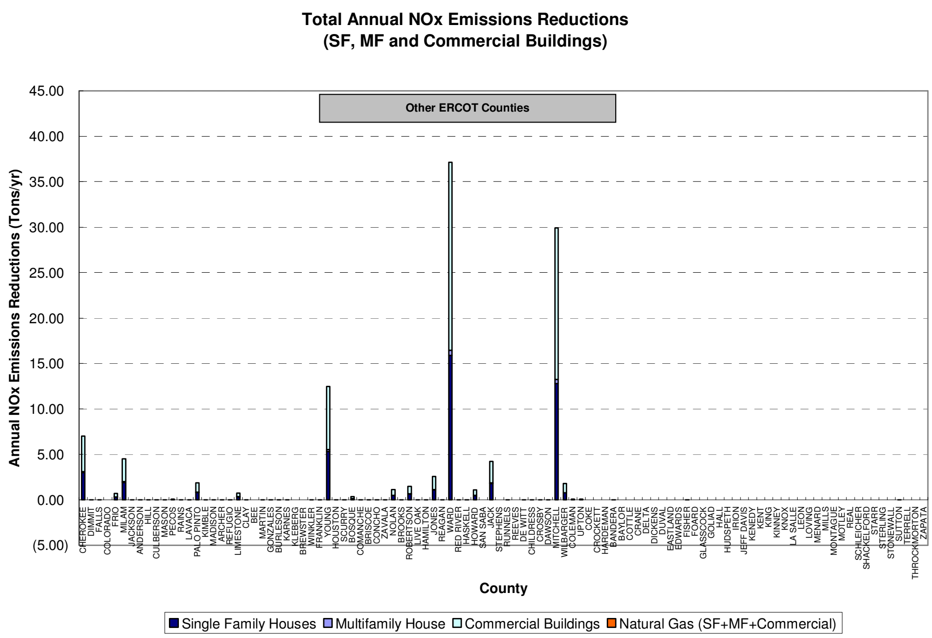
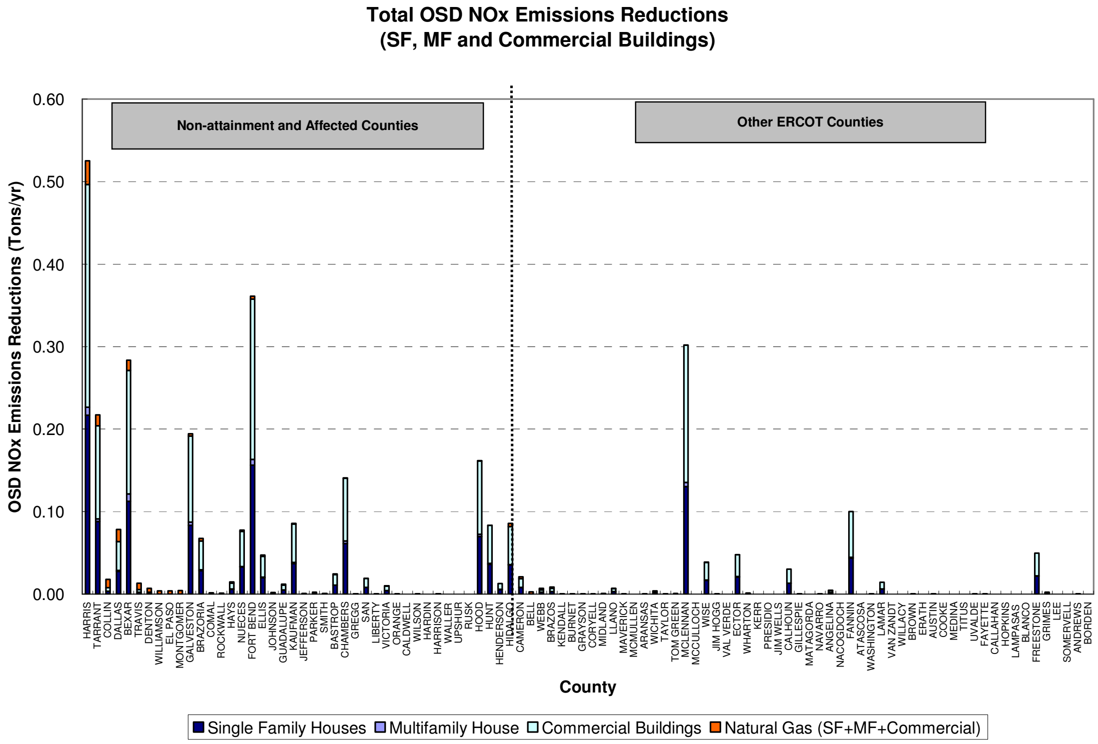


Figure 118: 2006 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family, Multi-family Residences, and Commercial Buildings by County (using 2007 eGRID).



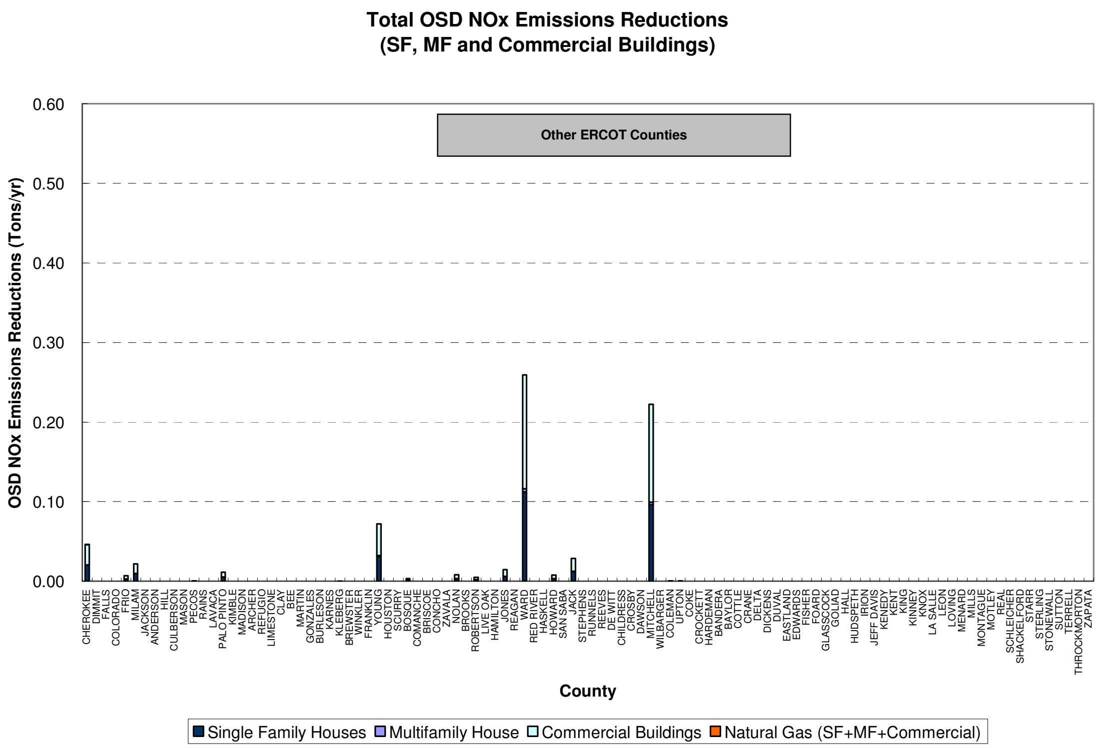
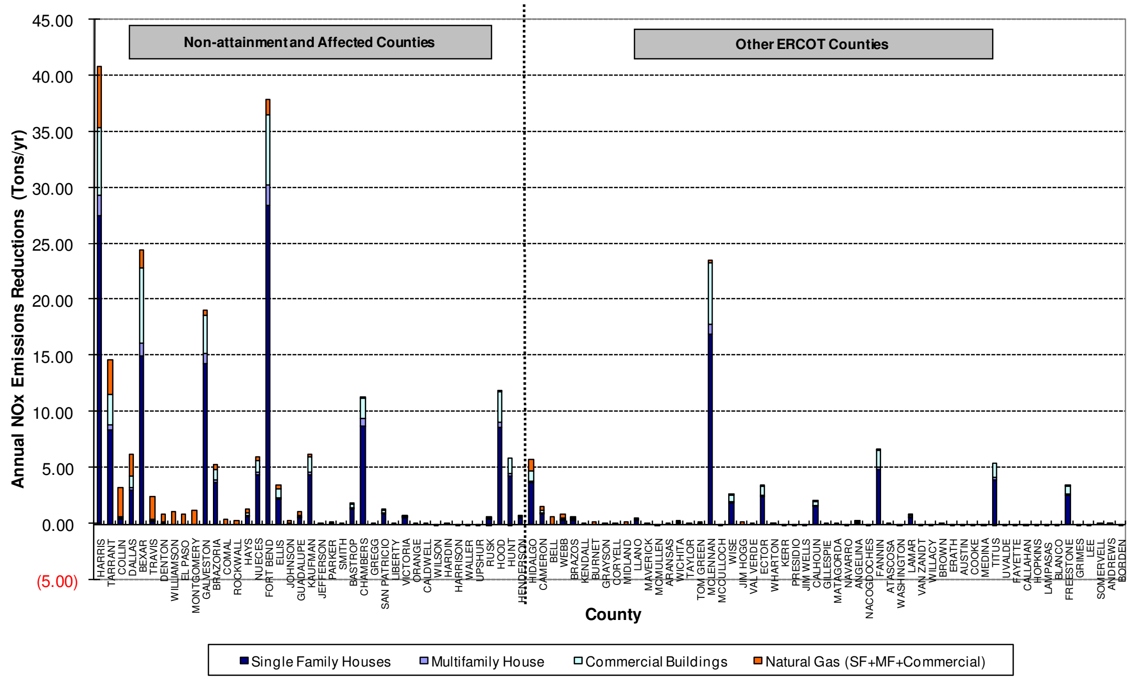


Figure 119: 2006 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family, Multi-family Residences, and Commercial Buildings by County (Using 2007 eGRID).

Total Annual NOx Emissions Reductions (SF, MF and Commercial Buildings)



Total Annual NOx Emissions Reductions (SF, MF and Commercial Buildings)

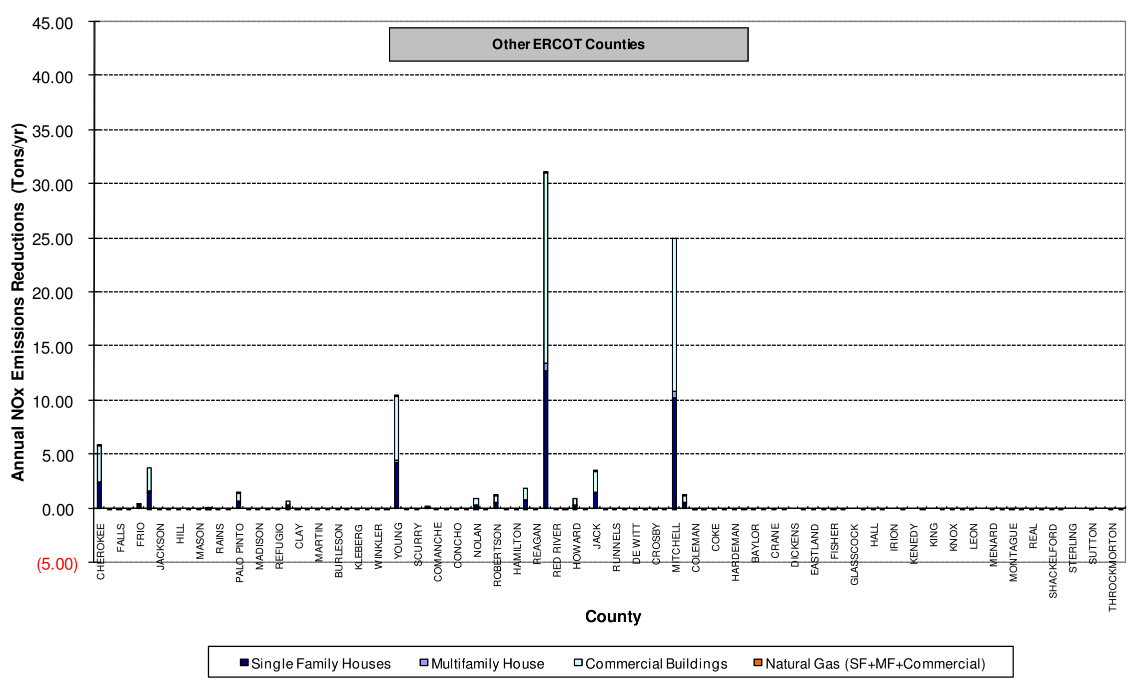
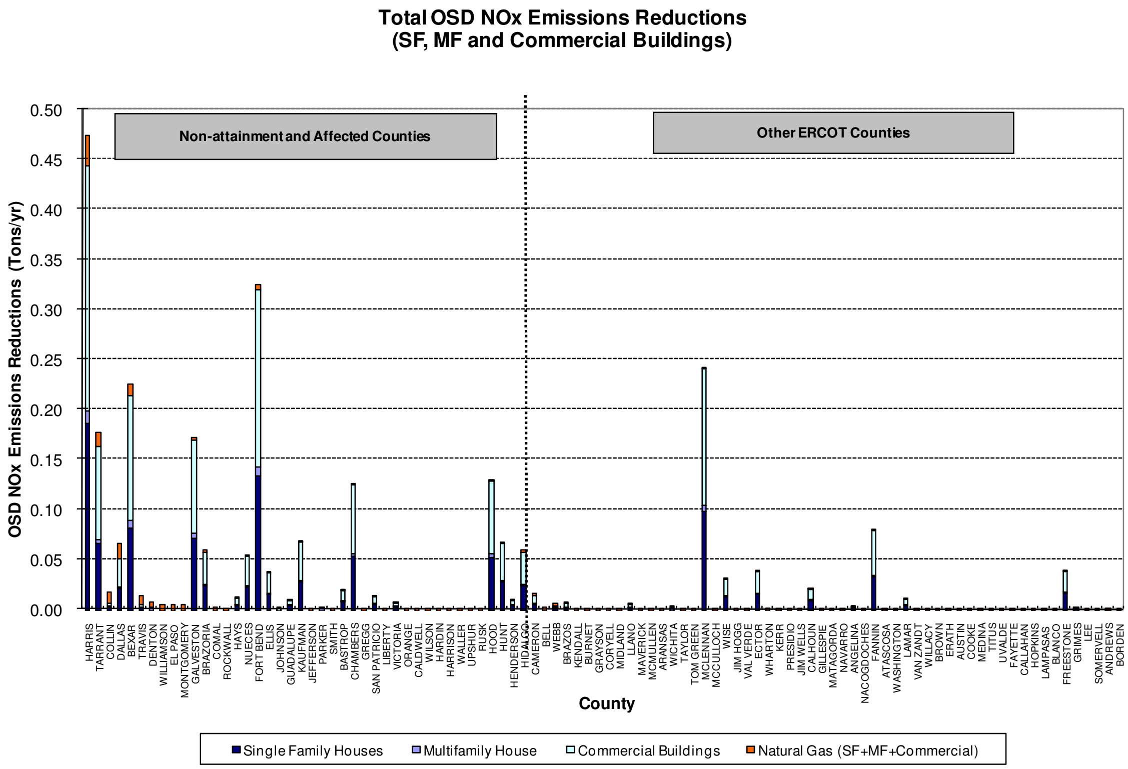


Figure 120: 2007 Annual NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County



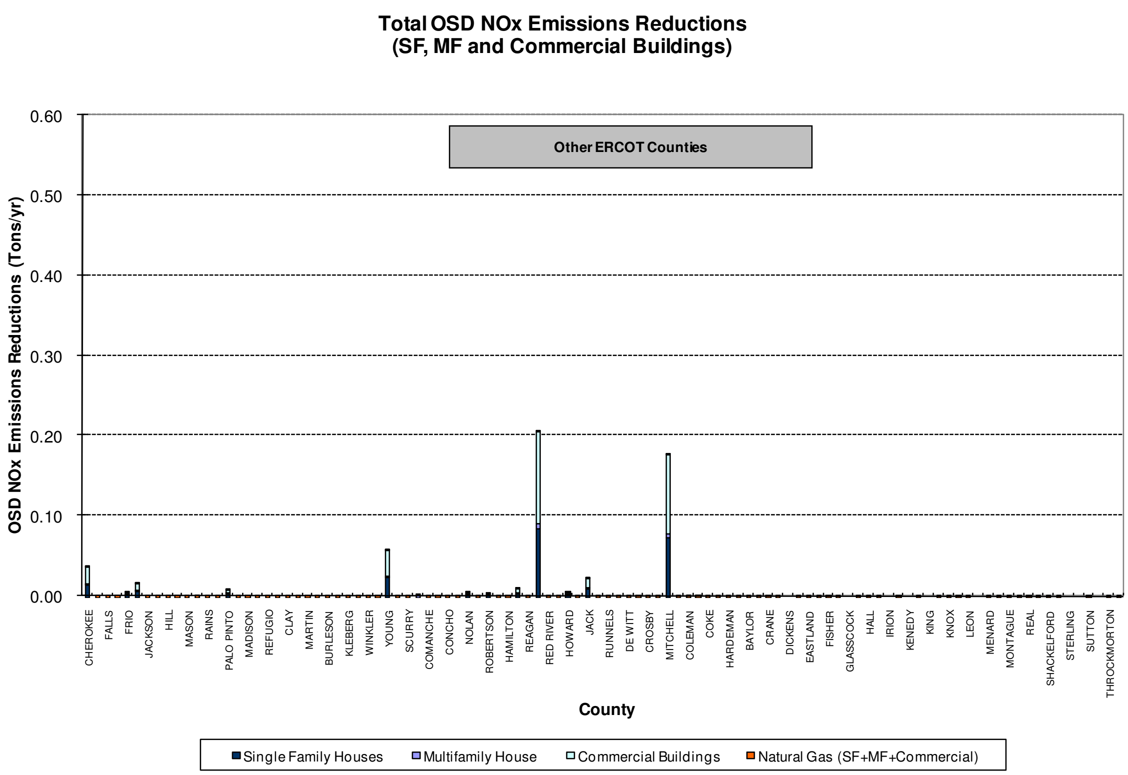


Figure 121: 2007 OSD NOx Reductions from Electricity and Natural Gas Savings Due to the IECC / IRC for Single-family and Multi-family Residences and for Commercial Buildings by County

Table 85: Comparison of 2007 Emissions Reductions vs. 2006 Emissions Reductions from Implementation of the IECC / IRC to Single-family, Multi-family Residential, and Commercial Construction.

ITEM	2007 (2007 eGRID)	2006 (2007 eGRID)	% Diff.
Annual (tons-NOx/yr)			
Total-Electricity and N.G.	323.34	361.24	-10%
Single-Family Electricity	217.18	263.32	-18%
Multi-Family Electricity	13.39	10.88	23%
Commercial Electricity	62.23	60.52	3%
N.G. (SF+MF+Commercial)	30.54	26.53	15%
OSD (tons-NOx/yr)			
Total-Electricity and N.G.	1.90	2.22	-14%
Single-Family Electricity	1.27	1.63	-22%
Multi-Family Electricity	0.08	0.07	14%
Commercial Electricity	0.39	0.38	3%
N.G. (SF+MF+Commercial)	0.16	0.15	7%

7.1.1.1 Changes in single family input file

There have been 6 major version changes according to the changes in the single family input file since the 2006 annual simulations. Table 1.1 presents the summarized description of the changes in single family input file since the 2006 annual simulation.

Table 1.1 Changes in single family input file

BDL Version	Description
2.01.00	BDL used for the 2006 annual report
2.20.03	Added parameters for framing factor (b23,b24,b25,b26) Updated envelop dimension accordingly
2.20.12	Updated attic AIR-CHANGES/HR to be 15ACH Modified floor covering to be 80% carpet and 20% exposed floor Updated window-to-wall ratio for second floor windows
2.30.22	Updated Reff for underground floor Updated RF_1 and RF_2 (tilted roof INSIDE-FILM-RES), BATT-WALL, BATT-CEIL, EPS-WALL, used 2' WINDOW sill height and dynamic glass XY position
2.40.08	Modified thermostat schedule Updated to 4 surface model
2.50.00	Converted to single zone model
2.50.01	Zoning change heat pump system setting change DOE-2 curves changed to Henderson's curve Infiltration method changed Updated Heat pump, 1CFM/ft2 changed to 360CFM/Ton Heating vs. Cooling capacity changed to 1:1

A. Version 2.20.03

Added parameters for framing factor

The first change in the input file was that framing factor was added in the original 2006 input file. Four parameters that were blank last year's version, b23, b24, b25, and b26 were used to define the framing factor. The b23, b24, b25 and b26 were assigned to exterior walls, sloping roof above attic, flat roof and ceiling and floor above crawl space and between first and second floor, respectively. Building envelop dimensions were also modified accordingly.

In version 2.20.03, four parameters - b23, b24, b25, and b26 were assigned for framing-factor for: (i) exterior walls, (ii) sloping roof above attic, (iii) ceiling and flat roof, and (iv) floor above crawlspace, and between first and second floors, respectively. Building envelop dimensions were also modified accordingly.

In the previous version, the framing-factors were fixed to 12.5% for walls considering wall studs spaced at 16" on-center, and 8.33% for roof considering roof joists spaced at 24" on-center. The additional wall framing members including base plate, top plates, and structural reinforcement for window and door openings (i.e. for window sill, window and door lintels and sides supporting lintels) were not taken into account. Similarly, additional framing members of the roof and ceiling were not considered.

In order to assign default values to these four parameters, a survey of literature was performed. To verify the findings from literature, site-survey of two residential buildings under-construction in College Station, TX was performed. For these sites, detail measurements were taken and framing-factors were calculated using two approaches. In addition, the impact of varying framing-factor on the heat loss and gain through the wall, as well as on the energy use is analyzed.

The details of conventional wood-frame construction were investigated using the illustrations published in a report by American Wood Council (2001). The framing-factors were investigated using CEC (2002) and (Carpenter and Schumacher 2003). According to CEC (2002), the current residential walls in low-rise residential buildings in California have 27% wall framing-factor. Based on an audit of 180 wood-frame dwellings during construction across the U.S., representative framing-factors were determined as 25% for walls, 7% for ceilings and 12% for floors, resulting in an overall framing-factor of 16% (Carpenter and Schumacher 2003).

For determining framing-factors from site-surveys, two one-story residential buildings in College Station, TX, under-construction by two different builders were selected. To compare and analyze the construction, pictures and measurements were taken. Figure 122 compares the construction details for window and door openings, and roof for the two sites.

It is observed that a 2x4 stud is used as base plate, and two 2x4 studs are used as top plates. In the wood-frame construction with 2x4 studs spaced at 16" on-center, any gap between 16" and 32" wide essentially has a stud resulting in more frame area in case of walls having openings, corners and joints than it would otherwise have. A lintel over openings consists of a 2x4 stud (placed horizontally) and two 2x8 stud (placed vertically), vertical 2x4 studs spaced at 16" on-center running up to the top plate. A 3' wide window opening requires three pair of studs on each side including: one pair supporting the window sill, second pair supporting the lintel, and the third pair continued up to the top plate. A 6' wide opening requires four pair of studs on each side including two pairs supporting the lintel. Additional 2x4 studs support window sill. A portion of wall having openings above the lintel essentially has only framing, and no gap or cavity between the framing members.

The roof is constructed with 2x6 studs (rafters) spaced at 24" on-center, spanning from the ridge beam to and beyond the top plate of the wall. For a wide span, rafters are spaced at 16" on-center. In addition, collar beams at 48" on-center are used to connect the rafters facing each other. Figure 123 shows additional construction details for raised ceiling.

In order to calculate the exterior wall framing-factor, two approaches were followed: 1) using detail measurements, and 2) analysis of typical arrangement of studs. For the first approach, measurements were taken and a detail calculation was performed. Figure 124 shows the building layout at site 1 indicating the studs for the exterior walls A to J. Figure 125 shows the elevation of one of the walls (Wall ID: F) showing framing members for the wall including the openings. Similar analysis was performed for each wall. Table 86 shows the framing-factor calculation for each wall, which indicates that framing-factor increases proportionally with area of openings. For this particular building (at Site 1), the conditioned floor area is 1,677 sq.ft. The gross wall area is 1600 sq.ft., which includes 256 sq.ft. area of openings. Thus, for a 16% overall opening-to- wall area ratio, the average wall framing-factor is 23.2%.

In the second approach, considering that these buildings represent typical construction practices, equations were derived for wall framing-factors without and with window openings to account for extra framing member required per window opening. This procedure is shown in Figure 126. Using these equations, variation in wall framing-factor with respect to window-to-wall area ratio (WWR) was determined. Figure 127 shows this correlation for two scenarios, i.e., (i) with a given wall dimension that resulted in a non-integer number of windows; (ii) with given (integer) number of windows. For each scenario, correlations for walls with 3'x5' and 6'x5' window openings are plotted. Using these plots, average framing-factor for given WWR can be determined. For example, framing-factor for a window-less wall is 18-19%, which increase up to 25-28% for 15% WWR and can be over 35% for 25% WWR.

Finally, the impact of varying wall framing-factor on the heat loss and gain through the wall, as well as on the energy use is analyzed using DOE-2 simulations. Figure 128 shows percent difference in these variables compared to a house with a 9% wall framing-factor. With wall framing-factor increased from 9% to 25%, up to 10% increase in the heat loss and 6% increase in the heat gain through the wall, 10.5% increase in the space heating energy use, negligible impact on the space cooling energy use and 1.3% increase in total energy use is resulted.

Figure 122: Construction Details for Window and Door Openings, and Roof at Site 1 (Above) and Site 2 (Below)

Figure 123: Details of Raised Ceiling Construction at Site 1 (Left) and Site 2 (Middle and Right)

Approach 1: Determination of Exterior Wall Framing-factor using Measurements from Site 1

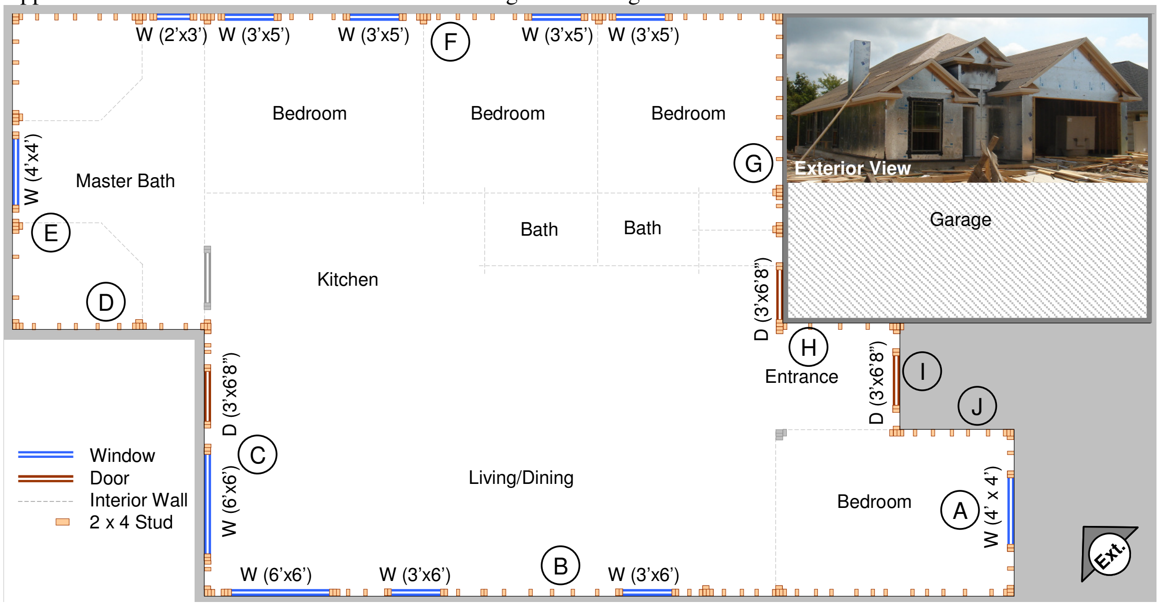


Figure 124: Building Layout at Site 1 indicating the Number and Spacing of 2x4 Studs for Exterior Walls

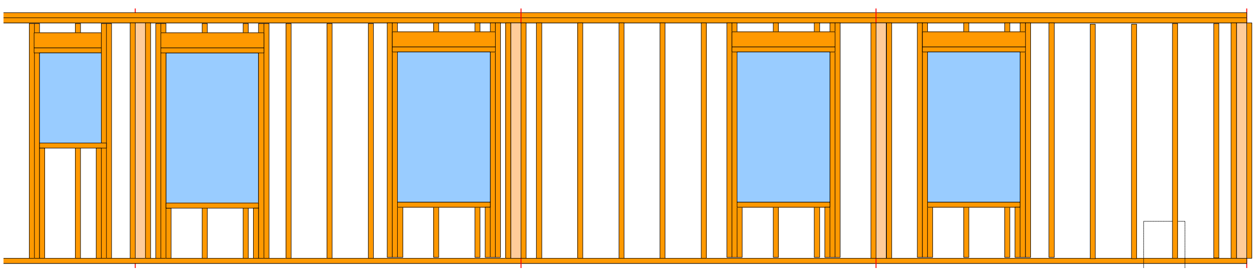


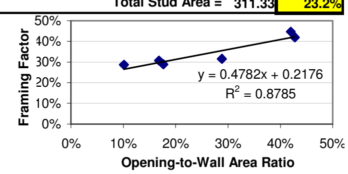
Figure 125: Elevation of Exterior Wall "F" at Construction Site 1

Table 86: Calculation of Framing-factor

Wall				Windows/Door							Main Studs				Studs for Window Openings						Total for Studs		Framing Factor
ID#	Length	Height	Area	No.	Width	Height	Lintel Height	Sill Height	Area	Opening-to-wall Area Ratio	Base and Top Plate		Vertical Members		Headers		Above Lintel		Below Sill				
											No.	Length	No.	Length	No.	Length	No.	Length	No.	Length	Length	Area	
	L (ft.)	H (ft.)	sq. ft.		w (ft.)	h (ft.)	l (ft.)	(l-h) (ft.)	sq. ft.	%		ft.		ft.		ft.		ft.		ft.	ft.	sq. ft.	%
A	10	8.33	83.33	1	4	6	7	1	24	28.8%	3	10.00	8	7.83	4	4.00	3	0.33	4	0.67	112.33	18.72	31.6%
B	49	8.33	408.33	2	3	6	7	1	72	17.6%	3	49.00	48	7.83	4	3.00	2	0.33	4	0.67	583.00	97.17	28.9%
				1	6	6	7	1							4	6.00	4	0.33	6	0.67			
C	16	8.33	133.33	1	6	6	7	1	57	42.8%	3	16.00	13	7.83	4	6.00	4	0.33	6	0.67	191.83	31.97	41.9%
				1	3	7	7								4	3.00	2	0.33					
D	12	8.33	100.00								3	12.00	13	7.83							137.83	22.97	23.0%
E	19	8.33	158.33	1	4	4	7	3	16	10.1%	3	19.00	20	7.83	4	4.00	3	0.33	5	2.67	244.00	40.67	28.6%
F	47	8.33	391.67	1	2	3	7	4	66	16.9%	3	47.00	56	7.83	4	2.00	1	0.33	3	3.67	599.00	99.83	30.7%
				4	3	5	7	2							4	3.00	2	0.33	4	1.67			
G	19	8.33	158.33								3	19.00	21	7.83							221.50	36.92	23.3%
H	6	8.33	50.00								3	6.00	5	7.83							57.17	9.53	19.1%
I	6	8.33	50.00	1	3	7	7		21	42.0%	3	6.00	6	7.83	4	3.00	2	0.33			77.67	12.94	44.6%
J	8	8.33	66.67								3	8.00	7	7.83							78.83	13.14	19.7%
Gross Wall Area =			1600.00	Total Area of Openings =					256.00	16.0%									Total Stud Area =			311.33	23.2%

Conditioned Floor Area = 1,677 sq. ft. (Garage Area = 380 sq. ft.)
Area of Openings = 256.00 sq. ft.
Area of Glazed Openings = 235.00 sq. ft.
Openings-to-floor Area Ratio = 15.3%
Window-to-floor Area Ratio = 14.0%

Legend
- Measured Inputs
- Fixed/Calculated
- Not Applicable
- for Window/Door Openings
- Framing Factors



Approach 2: Determination of Exterior Wall Framing-factor using Typical Arrangement of Studs

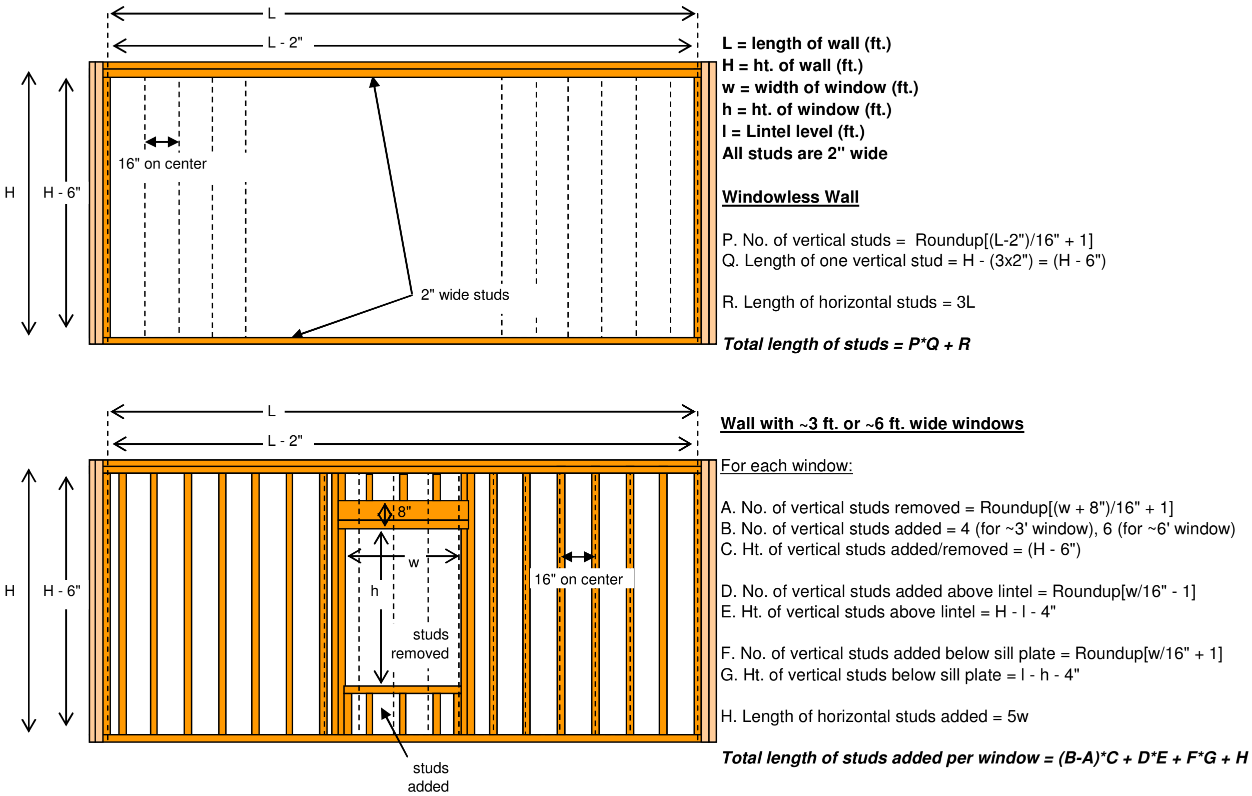


Figure 126: Calculation of Stud Area for a Typical Exterior Wall without and with Window Openings

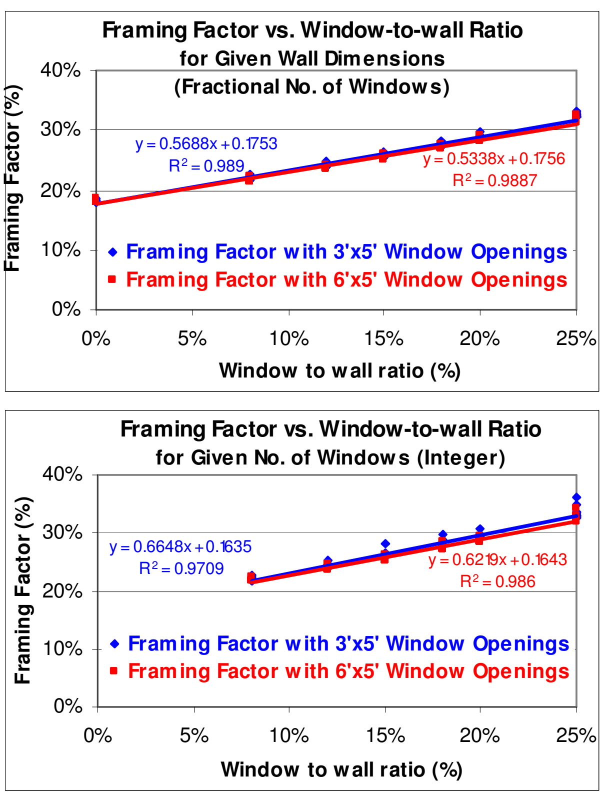
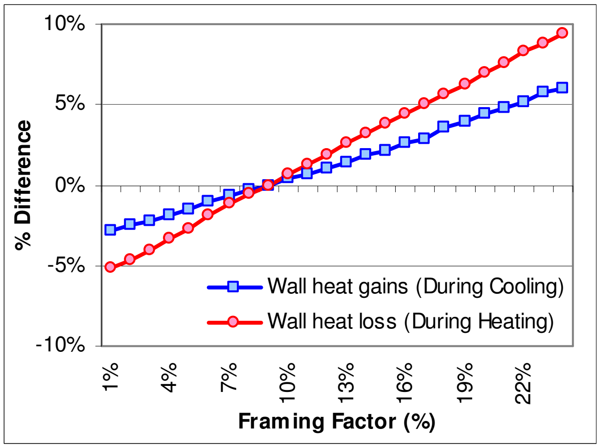


Figure 127: Framing-factor for Varying Window-to-Wall Area Ratio (using Equations derived in Figure 126)



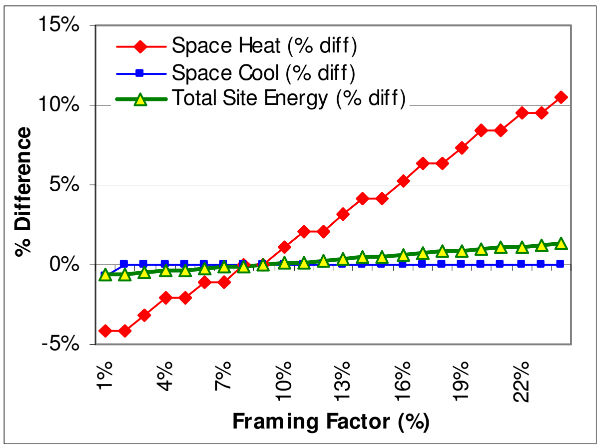


Figure 128: Impact of Framing-factor on the Heat Gain and Loss (Left) and Energy Use (Right)

```
$******************FRAMING FACTOR (M.MALHOTRA, 08/09/2007)
##SET1 P-WALL-FF b23          $ FOR EXTERIOR WALLS ABOVE GROUND (CONDITIONED
                              SPACES, CRAWLSPACE AND GABLE ENDS OF ATTIC)
##SET1 P-ROOF-FF b24          $ FOR SLOPING ROOF ABOVE ATTIC
##SET1 P-CEIL-FF b25          $ FOR FLAT ROOF AND CEILING
##SET1 P-FLOOR-FF b26         $ FOR FLOOR ABOVE CRAWLSPACE AND BETWEEN FIRST
                              AND SECOND FLOOR
```

B. Version 2.20.12

Updated attic AIR-CHANGES/HR to be 15ACH

```
$_________ATTIC SPACE-CONDITIONS
ATTIC = SPACE-CONDITIONS
          TEMPERATURE = (73)     $ AVERAGE OF WINTER AND SUMMER SETPOINTS (68F &
78F) (TABLE 402.1.3.5, IECC 2001)
          ZONE-TYPE   = UNCONDITIONED         $ SETBACKS ARE ADJUSTED IN SYSTEMS,
DOE-2 DEFAULT = 70
      FLOOR-WEIGHT    = P-FLOORWEIGHT[]       $ IECC 2001,402.1.3.3,DOE-2 DEFAULT =
70(LB/SQ.FT)
          INF-SCHEDULE    = INFILSCH
          INF-METHOD      = AIR-CHANGE$ DOE-2 DEFAULT=NONE,OR CRACK, RESIDENTIAL
          AIR-CHANGES/HR          = 15      $ ACH=NORMALIZED LEAKAGE (0.57)x WEATHER
FACTOR(FROM ASHRAE STANDARD 136)
```

```
.. $ END OF SPACE-CONDITIONS COMMAND (OTHER COMMANDS IN SET-DEFAULT FOR SPACE-CONDITIONS)
```

Modified floor covering to be 80% carpet and 20% exposed floor

2006

```
UGFL_1 = LAYERS $ SLAB-ON-GRADE FLOOR
    MATERIAL = (MAT-FIC-1,SOIL-12IN,CONCRETE-4IN)
    INSIDE-FILM-RES = 0.77 ..
```

2007

```
UGFL_1 = LAYERS $ SLAB-ON-GRADE FLOOR
    MATERIAL = (MAT-FIC-1,SOIL-12IN,CONCRETE-4IN, CP80)
    INSIDE-FILM-RES = 0.77 ..
        .
        .
        .
        .
CP80 = MATERIAL $ 80% CARPET, 20% EXPOSED FLOOR
    RESISTANCE = #[0.8 * 1.23] .. $ (HR.FT^2.F/BTU)
```

Updated window-to-wall ratio for second floor windows

2006

```
W-F-2 = WINDOW $ AS PER IECC 2001(402.1.3.1.1) WINDOWS HAVE SAME AREA ON THE N,W,E AND S FACES AS A MINIMUM
    WIDTH = P-GLASSWIDTH1[] $ (FT)
    HEIGHT = P-GLASSHEIGHT1[] $ (FT)
    X = W-F-1[]
    Y = 1 $ COORDINATES
    SETBACK = 0.0 $ (FT)
    SHADING-SCHEDULE = SH-1 $ SHADING SCHEDULE FOR THE WINDOW SHADE
    GLASS-TYPE = W-1
    FRAME-WIDTH = WFWSW1[] $ EXPLANATION IN THE PARAMETER SECTION
    SHADING-DIVISIONS = 10 $ DOE-2 DEFAULT, (0 TO 40)UNITS
    .. $ END OF WINDOW COMMAND
```

2007

```
##IF #[WWR1-2[] GT 0] $ (09/19/2007, M.MALHOTRA)
WINDOW1-2 = WINDOW $ AS PER IECC 2001(402.1.3.1.1) WINDOWS HAVE SAME AREA ON THE N,W,E AND S FACES AS A MINIMUM
        HEIGHT = GLASSHT1-2[]
        WIDTH = GLASSWID1-2[]
        GLASS-TYPE = GLASS-1
        X = WX1-2[]
        Y = 1
        FRAME-WIDTH = FR-EQW1-2[] $ DOE-2 DEFAULT = 0(0 TO 2)
        OVERHANG-A = WX1-2[]
        OVERHANG-B = OVERHANGHT[]
        OVERHANG-W = OVERHANGWID1-2[]
        OVERHANG-D = P-OVERHANGD1-2[]
        ..
    $ END OF WINDOW COMMAND (OTHER COMMANDS IN SET-DEFAULT FOR WINDOW)
##ENDIF
```

C. Version 2.30.22

Updated Reff for underground floor

2006

```
##SET1 P-REFFECTIVE #[P-AREA[] / #[PERIM-CON[] * P-PERIMETER[]]]
                                    $ Reff=A/(f2*Pexp), f2 is from article by Winkelmann
##SET1 P-UEFFECTIVE #[1 / P-REFFECTIVE[]]            $ U-EFFECTIVE = 1/Reff
```

2007

```
$__________Reff=A/(F2*Pexp), F2 is from article by Winkelmann
$__________CORRECTING EFFECTIVE PERIMENTER FOR GARAGE TYPE D JAYA M. 12/14/2007
$__________For the case of Garage Type equals D
$__________The corrected value of the effective perimeter will assume a square house of equal area

##IF #[GTYPE[] NES D]
##SET1 PERIMETER-UGF  PERIMETER-1[]
##SET1 AREA-UGF  AREA-1[]
##ELSEIF #[GTYPE[] EQS D]
    ##IF P-STORY[] EQS 1
    ##SET1 PERIMETER-UGF #[#[SQRT OF TOTALAREA[]] * 4]
    ##SET1 AREA-UGF  AREA-1[]
    ##ELSEIF P-STORY[] EQS 2
     ##IF #[P-BLDGLEN-2[] EQS P-BLDGLEN-1[]]
     ##SET1 PERIMETER-UGF #[#[SQRT OF #[TOTALAREA[] / 2]] * 4]
     ##SET1 AREA-UGF #[TOTALAREA[] / 2]
     ##ELSEIF #[P-BLDGLEN-2[] NES P-BLDGLEN-1[]]
     ##SET1 PERIMETER-UGF #[#[SQRT OF AREA-1[]] * 4]
     ##SET1 AREA-UGF  AREA-1[]
     ##ENDIF
    ##ENDIF
##ENDIF

##SET1 R-EFF-1 #[AREA-UGF[] / #[PERIM-CON[] * PERIMETER-UGF[]]]

##SET1 U-EFF-1 #[1 / R-EFF-1[]]            $ Ueff = 1/Reff
```

Updated HDD error in exposed floor insulation and INSIDE-FILM-RESISTNACE of interior floor
Updated RF_1 and RF_2 (tilted roof INSIDE-FILM-RESISTNACE), BATT-WALL, BATT-CEIL, EPS-WALL, WINDOW s

Updated RF_1 and RF_2 (tilted roof INSIDE-FILM-RES), BATT-WALL, BATT-CEIL, EPS-WALL, used 2' WINDOW sill height and dynamic glass XY position

2006

```
RF_1      = LAYERS              $ NON-STUD PART OF ROOF
   ##IF #[P-ROOF_CAVINSPOS[] EQS R]
      MATERIAL = (AR02,PW03,ROOF_CAVINS[])  .. $ Choice of external finish
     ##IF #[P-ROOF_RB[] EQS "Y"]
        I-F-R = 8.1
     ##ENDIF
   ##ELSEIF #[P-ROOF_CAVINSPOS[] EQS C]            $ELSEIF ROOF INSULATION NOT PRESENT
      MATERIAL = (AR02,PW03)  ..
```

```
        ##IF #[P-ROOF_RB[] EQS "Y"]
                I-F-R = 8.1
        ##ENDIF
    ##ENDIF

RF_2        = LAYERS
          MATERIAL = (AR02,PW03, ROOF_STUD[])
        ##IF #[P-ROOF_RB[] EQS "Y"]
                I-F-R = 8.1
        ##ENDIF
                ..
```

2007

```
RF_1        = LAYERS                        $ NON-STUD PART OF ROOF
        ##IF #[P-ROOF_RB[] EQS Y]
                INSIDE-FILM-RES = 8.1               $ INSIDE FILM RESISTANCE
        ##ELSEIF #[P-ROOF_RB[] EQS N]
                INSIDE-FILM-RES = #[0.765 - #[P-PITCH[] * #[0.085 / 90]]]
        ##ENDIF
        ##IF #[P-ROOFRPOS[] EQS R]
                MATERIAL = (AR02,PW03,BATT-CEIL)  ..
        ##ELSEIF #[P-ROOFRPOS[] EQS C]               $ ELSEIF ROOF INSULATION NOT PRESENT
                MATERIAL = (AR02,PW03)  ..
        ##ENDIF

RF_2        = LAYERS
        ##IF #[P-ROOF_RB[] EQS Y]
                INSIDE-FILM-RES = 8.1
        ##ELSEIF #[P-ROOF_RB[] EQS N]
                INSIDE-FILM-RES = #[0.765 - #[P-PITCH[] * #[0.085 / 90]]]
        ##ENDIF
                MATERIAL = (AR02,PW03, ROOF_STUD[])    ..
```

D. Version 2.40.08

Modified thermostat schedule

In order to have 6 hour winter setback during the night and 6 hour summer setup during the day.

2006

```
HEAT-1 = DAY-SCHEDULE
      HOURS = (1,6)
##IF #[SETBACK[] EQS Y]
      VALUES = (63,63,63,63,63,63)          $PAGE 64,IECC  2001,ASSUMED A MORNING SETBACK
##ELSEIF #[SETBACK[] EQS N]                 $OF 6 HOURS AT 5 DEG F
      VALUES = (68,68,68,68,68,68)
##ENDIF
      HOURS = (7,17)
      VALUES = (68,68,68,68,68,68,68,68,68,68,68)
      HOURS = (18,24)
      VALUES = (68,68,68,68,68,68,68)   ..


HEAT-2 = DAY-SCHEDULE
      HOURS = (1,6)
##IF #[SETBACK[] EQS Y]
      VALUES = (63,63,63,63,63,63)          $PAGE 64,IECC  2001,ASSUMED A MORNING SETBACK
##ELSEIF #[SETBACK[] EQS N]                 $OF 6 HOURS AT 5 DEG F
      VALUES = (68,68,68,68,68,68)
##ENDIF
      HOURS = (7,17)
```

```
        VALUES = (68,68,68,68,68,68,68,68,68,68,68)
        HOURS = (18,24)
        VALUES = (68,68,68,68,68,68,68)   ..

DAYHEAT = WEEK-SCHEDULE
         DAYS = (MON,FRI)
         DAY-SCHEDULE = HEAT-1
         DAYS = (WEH)
         DAY-SCHEDULE = HEAT-2   ..

THEAT = SCHEDULE
        THRU DEC 31   DAYHEAT   ..

COOL-1 = DAY-SCHEDULE
        HOURS = (1,6)
##IF #[SETBACK[] EQS Y]
        VALUES = (83,83,83,83,83,83)            $PAGE 64,IECC  2001,ASSUMED A MORNING SETUP
##ELSEIF #[SETBACK[] EQS N]                     $OF 6 HOURS AT 5 DEG F
        VALUES = (78,78,78,78,78,78)
##ENDIF
        HOURS = (7,17)
        VALUES = (78,78,78,78,78,78,78,78,78,78,78)
        HOURS = (18,24)
        VALUES = (78,78,78,78,78,78,78)   ..

COOL-2 = DAY-SCHEDULE
        HOURS = (1,6)
##IF #[SETBACK[] EQS Y]
        VALUES = (83,83,83,83,83,83)            $PAGE 64,IECC  2001,ASSUMED A MORNING SETUP
##ELSEIF #[SETBACK[] EQS N]                     $OF 6 HOURS AT 5 DEG F
        VALUES = (78,78,78,78,78,78)
##ENDIF
        HOURS = (7,17)
        VALUES = (78,78,78,78,78,78,78,78,78,78,78)
        HOURS = (18,24)
        VALUES = (78,78,78,78,78,78,78)   ..

DAYCOOL = WEEK-SCHEDULE
         DAYS = (MON,FRI)
         DAY-SCHEDULE = COOL-1
         DAYS = (WEH)
         DAY-SCHEDULE = COOL-2   ..

TCOOL = SCHEDULE
        THRU DEC 31   DAYCOOL  ..
```

2007

```
$**********AMENDED 05/02/2008, MODIFIED THERMOSTAT SCHEDULE TO HAVE 6 HOUR WINTER
SETBACK DURING NIGHT (HOUR 1-5,24)
$**********AND 6 HOUR SUMMER SETUP DURING THE DAY (HOUR 9-14)
HEAT-1 = DAY-SCHEDULE
##IF #[P-SETBACK[] EQS Y]
        HOURS = (1,5)
        VALUES = (63)           $PAGE 64,IECC  2001,ASSUMED A 6 HOUR SETBACK (FROM HOUR 1-5,24) AT
5 DEG F
        HOURS = (6,23)
        VALUES = (68)
        HOURS = (24)
        VALUES = (63) ..
```

```
##ELSEIF #[P-SETBACK[] EQS N]
        HOURS = (1,24)
        VALUES = (68) ..
##ENDIF


HEAT-2 = DAY-SCHEDULE
##IF #[P-SETBACK[] EQS Y]
        HOURS = (1,5)
        VALUES = (63)           $PAGE 64,IECC  2001,ASSUMED A 6 HOUR SETBACK (FROM HOUR 1-5,24) AT
5 DEG F
        HOURS = (6,23)
        VALUES = (68)
        HOURS = (24)
        VALUES = (63) ..
##ELSEIF #[P-SETBACK[] EQS N]
        HOURS = (1,24)
        VALUES = (68) ..
##ENDIF

DAYHEAT = WEEK-SCHEDULE
         DAYS = (MON,FRI)
         DAY-SCHEDULE = HEAT-1
         DAYS = (WEH)
         DAY-SCHEDULE = HEAT-2   ..

THEAT = SCHEDULE
        THRU DEC 31   DAYHEAT   ..

COOL-1 = DAY-SCHEDULE
##IF #[P-SETBACK[] EQS Y]
        HOURS = (1,8)
        VALUES = (78)           $PAGE 64,IECC  2001,ASSUMED A 6 HOUR SETUP (FROM HOUR 9-14) AT 5
DEG F
        HOURS = (9,14)
        VALUES = (83)
        HOURS = (15,24)
        VALUES = (78) ..
##ELSEIF #[P-SETBACK[] EQS N]
        HOURS = (1,24)
        VALUES = (78) ..
##ENDIF

COOL-2 = DAY-SCHEDULE
##IF #[P-SETBACK[] EQS Y]
        HOURS = (1,8)
        VALUES = (78)           $PAGE 64,IECC  2001,ASSUMED A 6 HOUR SETUP (FROM HOUR 9-14) AT 5
DEG F
        HOURS = (9,14)
        VALUES = (83)
        HOURS = (15,24)
        VALUES = (78) ..
##ELSEIF #[P-SETBACK[] EQS N]
        HOURS = (1,24)
        VALUES = (78) ..
##ENDIF

DAYCOOL = WEEK-SCHEDULE
         DAYS = (MON,FRI)
         DAY-SCHEDULE = COOL-1
         DAYS = (WEH)
         DAY-SCHEDULE = COOL-2   ..
```

```
TCOOL = SCHEDULE
        THRU DEC 31   DAYCOOL  ..
```

Updated to 4 surface model

```
2007
##def BLDG0[b'01,b'02,b'03,b'04,b'05,b'06,b'07,b'08,b'09,b'10
         ,b'11,b'12,b'13,b'14,b'15,b'16,b'17,b'18,b'19,b'20
         ,b'21,b'22,b'23,b'24,b'25,b'26,b'27,b'28,b'29,b'30
         ,b'31,b'32]

$b'01   Length of first floor wall facing front(ft)
$b'02   Length of first floor wall facing back (ft)
$b'03   Length of first floor wall facing right (ft)
$b'04   Length of first floor wall facing left (ft)
$b'05   Length of second floor wall facing front(ft)
$b'06   Length of second floor wall facing back (ft)
$b'07   Length of second floor wall facing right (ft)
$b'08   Length of second floor wall facing left (ft)
$b'09   ON/OFF: Switch for activating/deactivating reports

##SET1 P-BLDG1-1 #[b'01 * 1]
##SET1 P-BLDG2-1 #[b'02 * 1]
##SET1 P-BLDG3-1 #[b'03 * 1]
##SET1 P-BLDG4-1 #[b'04 * 1]
##SET1 P-BLDG1-2 #[b'05 * 1]
##SET1 P-BLDG2-2 #[b'06 * 1]
##SET1 P-BLDG3-2 #[b'07 * 1]
##SET1 P-BLDG4-2 #[b'08 * 1]

##SET1 PERIMETER-1 #[#[b'01 + b'02] + #[b'03 + b'04]]
##SET1 PERIMETER-2 #[#[b'05 + b'06] + #[b'07 + b'08]]

##SET1 P-ECHO b'09

##enddef
```

E. Version 2.50.00

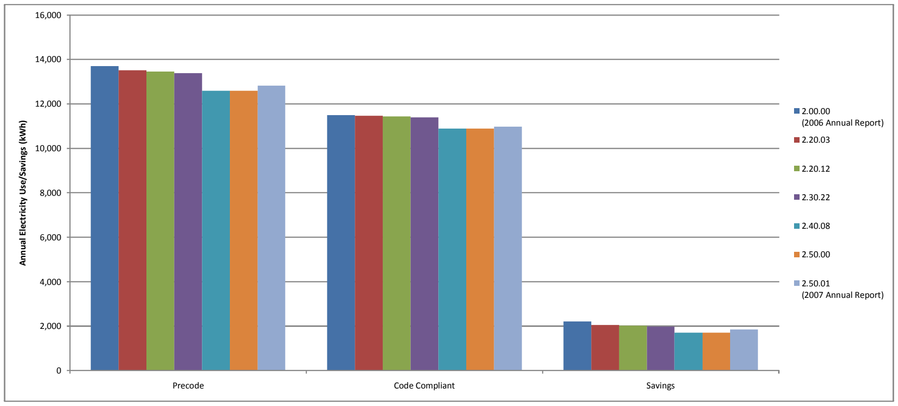
Converted to single zone model

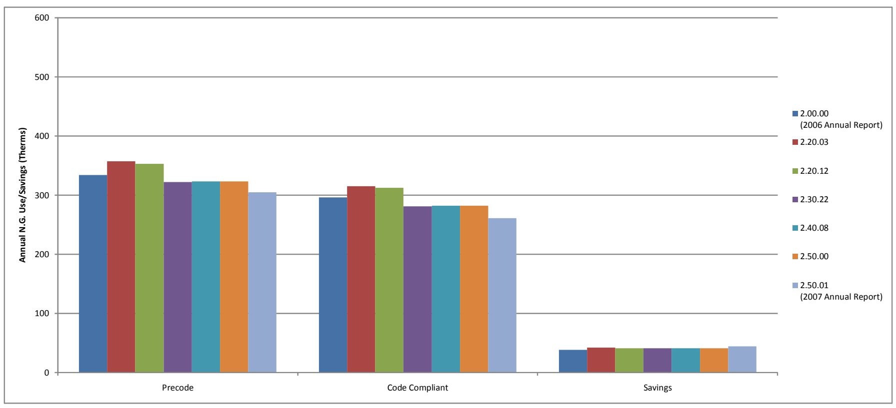
```
2006
##IF #[P-STORY[] EQS 2]
RM-2      = SPACE
          SPACE-CONDITIONS = ROOM-2         $ MODIFIED (08/17/2007, M.MALHOTRA)
          AREA = P-AREA-2[]                 $ (FT^2)
          VOLUME = VOLUME-2[]               $ (FT^3), S.KIM, 07/01/2003
          X = 2NDFCORX[]                    $ COORDINATES
          Y = 2NDFCORY[]                    $ COORDINATES
          Z = SPACEPOS-2[]                  $ AS PER THE DIMENSIONS OF THE CRAWLSPACE AS WELL AS
SPACE RM-1
          ..                                $ END OF SPACE COMMAND (OTHER COMMANDS IN SET-DEFAULT FOR
SPACE)

WALL1-2_1 = EXTERIOR-WALL                   $ THE INSULATION PART OF WALL
         HEIGHT = P-BLDGHT-2[]
         WIDTH = WALLWID1-2_1[]
         CONSTRUCTION = WALLCON_1
```

```
        X = 0
        Y = 0
        Z = 0
        AZIMUTH = 180
        ..          $ END OF EXTERIOR-WALL COMMAND (OTHER COMMANDS IN SET-DEFAULT FOR
EXTERIOR-WALL)

2007
##IF #[P-STORY[] EQS 2]

WALL1-2_1 = EXTERIOR-WALL                $ THE INSULATION PART OF WALL
        HEIGHT = P-BLDGHT-2[]
        WIDTH = WALLWID1-2_1[]
        CONSTRUCTION = WALLCON_1
        X = 0
        Y = 0
        Z = P-BLDGHT-1[]
        AZIMUTH = 180
        ..          $ END OF EXTERIOR-WALL COMMAND (OTHER COMMANDS IN SET-DEFAULT FOR
EXTERIOR-WALL)
```

Harris County (Default) (Using 1999 TRY)

Version	Precode 1 story, Slab-on-grade, Elec & N.G.			Code Compliant 1 story, Slab-on-grade, Elec & N.G.			Savings 2 story, Slab-on-grade, Elec & N.G.			Savings (% Diff. vs. 2.00.00)		
	Annual Elec. (kWh)	Annual N.G. (Therms)	Annual Total (MBtu)	Annual Elec. (kWh)	Annual N.G. (Therms)	Annual Total (MBtu)	Annual Elec. (kWh)	Annual N.G. (Therms)	Annual Total (MBtu)	Annual Elec.	Annual N.G.	Annual Total
2.00.00 (2006 Annual Report)	13,705	334	80.2	11,494	296	68.8	2,211	38	11.3	-	-	-
2.20.03	13,516	357	81.8	11,469	315	70.7	2,047	42	11.2	-7.4%	10.5%	-1.4%
2.20.12	13,458	353	81.2	11,442	312	70.3	2,016	41	11.0	-8.8%	7.9%	-3.2%
2.30.22	13,383	322	77.9	11,398	281	67.0	1,985	41	10.9	-10.2%	7.9%	-4.2%
2.40.08	12,598	323	75.3	10,888	282	65.4	1,710	41	9.9	-22.7%	7.9%	-12.4%
2.50.00	12,598	323	75.3	10,888	282	65.4	1,710	41	9.9	-22.7%	7.9%	-12.4%
2.50.01 (2007 Annual Report)	12,823	305	74.3	10,973	261	63.6	1,850	44	10.7	-16.3%	15.8%	-5.6%





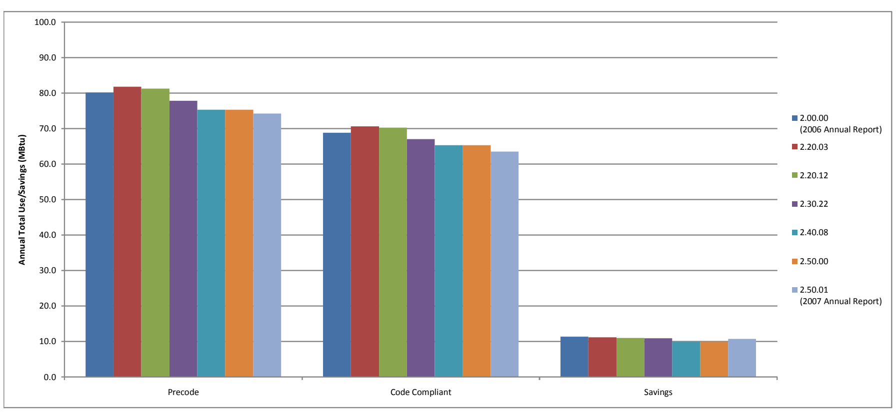
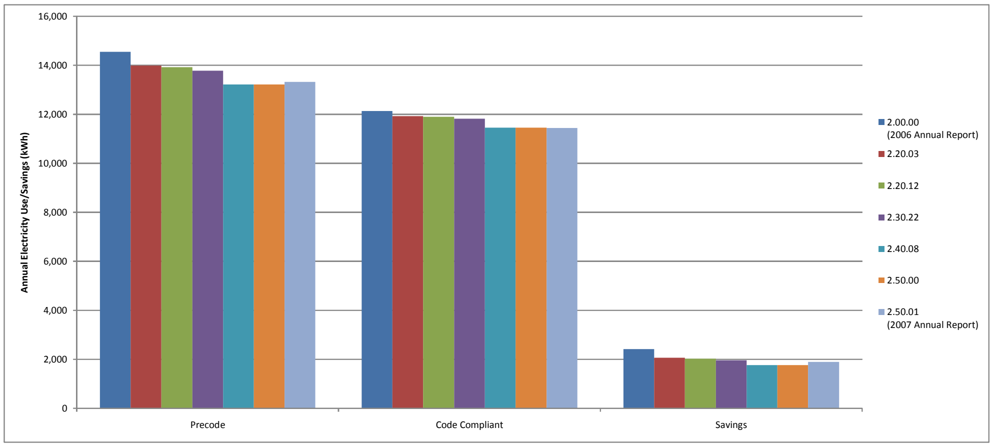
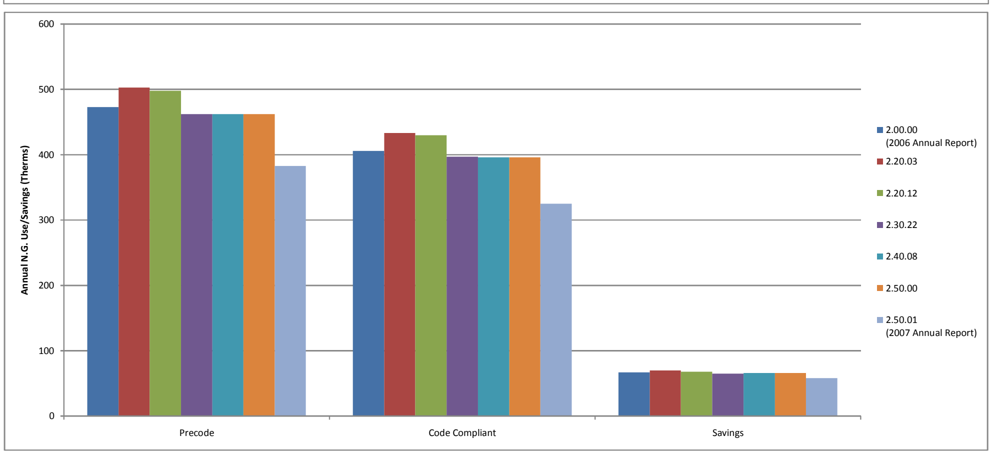


Figure 129: Results of Changes from 2006 to 2007.

Tarrant County (Default) (Using 1999 TRY)

Version	Precode 1 story, Slab-on-grade, Elec & N.G. Annual Elec. (kWh)	Annual N.G. (Therms)	Annual Total (MBtu)	Code Compliant 1 story, Slab-on-grade, Elec & N.G. Annual Elec. (kWh)	Annual N.G. (Therms)	Annual Total (MBtu)	Savings 2 story, Slab-on-grade, Elec & N.G. Annual Elec. (kWh)	Annual N.G. (Therms)	Annual Total (MBtu)	Savings (% Diff. vs. 2.00.00) Annual Elec.	Annual N.G.	Annual Total
2.00.00 (2006 Annual Report)	14,555	473	97.0	12,139	406	82.0	2,416	67	14.9	-	-	-
2.20.03	13,988	503	98.1	11,929	433	84.0	2,059	70	14.0	-14.8%	4.5%	-6.1%
2.20.12	13,926	498	97.3	11,902	430	83.6	2,024	68	13.7	-16.2%	1.5%	-8.3%
2.30.22	13,780	462	93.2	11,816	397	80.0	1,964	65	13.2	-18.7%	-3.0%	-11.7%
2.40.08	13,215	462	91.3	11,454	396	78.7	1,761	66	12.6	-27.1%	-1.5%	-15.6%
2.50.00	13,215	462	91.3	11,454	396	78.7	1,761	66	12.6	-27.1%	-1.5%	-15.6%
2.50.01 (2007 Annual Report)	13,327	383	83.8	11,435	325	71.5	1,892	58	12.3	-21.7%	-13.4%	-18.0%





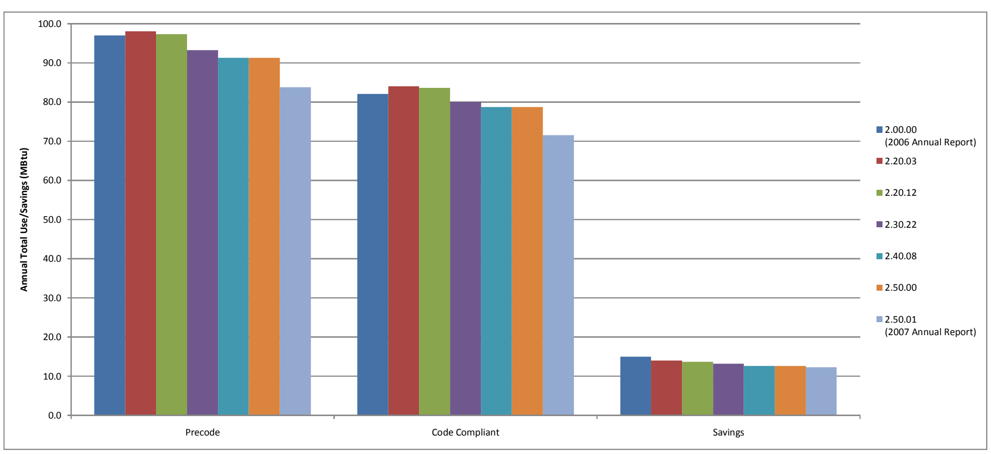


Figure 130: Results of Changes from 2006 to 2007.

8 CALCULATION OF INTEGRATED NOx EMISSIONS REDUCTIONS FROM MULTIPLE STATE AGENCIES PARTICIPATING IN THE TEXAS EMISSIONS REDUCTION PLAN (TERP).

8.1 Background

In January 2005, the Laboratory was asked by the Texas Commission on Environmental Quality (TCEQ) to develop a method by which the NOx emissions savings from the energy-efficiency programs from multiple Texas State Agencies working under Senate Bill 5 and Senate Bill 7 could be reported in a uniform format to allow the TCEQ to consider the combined savings for Texas' State Implementation Plan (SIP) planning purposes. This required that the analysis should include the cumulative savings estimates from all projects projected through 2020 for both the annual and Ozone Season Day (OSD) NOx reductions. The NOx emissions reduction from all these programs were calculated using estimated emissions factors for 2007 from the US Environmental Protection Agency (US EPA) eGRID database, which had been specially prepared for this purpose. The different programs included in the 2006 cumulative analysis are:

- ESL Single-family new construction
- ESL Multi-family new construction
- ESL Commercial new construction
- Federal Buildings
- Furnace Pilot Light Program
- PUC Senate Bill 7 and Senate Bill 5 Program
- SECO TERP Program
- Electricity generated by wind farms in Texas (ERCOT)[36]
- SEER13 upgrades to Single-family and Multi-family residences

The Laboratory's single-family and multi-family programs include the energy savings attained by constructing new residences in Texas according to the IECC 2000/2001 building code (IECC 2000). The baseline for comparison for the code programs is the published data on residential construction characteristics by the National Association of Home Builders (NAHB) for 1999 (NAHB 1999). Annual electricity (MWh) and natural gas (MBtu) savings are from the Laboratory's Annual Reports to the TCEQ (Haberl et al., 2002 - 2007).

The Texas Public Utility Commission's (PUC) Senate Bill and Senate Bill 7 programs include their incentive and rebates programs managed by the different Utilities for Texas (PUC 2007). These include the Residential Energy Efficiency Programs (REEP) as well as the Commercial & Industrial Standard Offer Programs (C&I SOP). The energy efficiency measures include high efficiency HVAC equipment, variable speed drives, increased insulation levels, infiltration reduction, duct sealing, Energy Star Homes, etc. Annual electricity savings according to the utilities (or Power Control Authorities – PCAs) were reported for the different programs completed in the years 2001 through 2007. The PUC also reported the savings from the TERP grant program which was conducted in 2002 and 2003.

The Texas State Energy Conservation Office (SECO) funds energy-efficiency programs directed towards school districts, government agencies, city and county governments, private industries and residential energy consumers. For the 2007 reporting year SECO submitted annual energy savings values for 149 projects which included projects funded by SECO and by Energy Service projects.

The *Electric Reliability Council of Texas (ERCOT) electricity production from currently installed green power generation (wind)* in Texas are reported. Projections through 2013 include planned projects by ERCOT, annual growth factors beyond 2013 comply with the Legislative requirements. Actual measured electricity production for 2001 through 2007, were included.

Finally, NOx emissions reductions from several other programs are also reported, including: energy efficiency measures applied to Federal buildings in Texas, reductions from the elimination of pilot lights in residential furnaces, and reductions from the installation of SEER 13 air conditioners in existing residences.

8.2 Description of the Analysis Method

Annual and Ozone Season Day (OSD) NOx emissions reduction were calculated for 2007 and cumulatively from 2007 to 2020 using several factors to discount the potential savings. These factors include an annual degradation factor, a

[36] ERCOT is the Electric Reliability Council of Texas.

transmission and distribution factor, a discount factor and growth factors as shown in Table 87, and are described as follows:

Annual degradation factor: This factor was used to account for an assumed decrease in the performance of the measures installed as the equipment wears down and degrades. With the exception of electricity generated from wind, an annual degradation factor of 5% was used for all the programs[37]. This value was taken from a study by Kats et al. (1996).

Transmission and distribution loss: This factor adjusts the reported savings to account for the loss in energy resulting from the transmission and distribution of the power from the electricity producers to the electricity consumers. For this calculation, the energy savings reported at the consumer level are increased by 7% to give credit for the actual power produced that is lost in the transmission and distribution system on its way to the customer. In the case of electricity generated by wind, the T&D losses were assumed to cancel out since wind energy is displacing power produced by conventional power plants, therefore, there is no net increase or decrease in T&D losses.

Initial discount factor: This factor was used to discount the reported savings for any inaccuracies in the assumptions and methods employed in the calculation procedures. For the Laboratory's single- and multi-family program, the discount factor was assumed to be 20%. For PUC's TERP and Senate Bill 2007 programs and electricity from wind, the discount factor was taken as 25%. For the savings in the SECO program, the discount factor was 60%.

Growth factor: The growth factors shown in Table 87 were used to account for several different factors. Growth factors for single-family (3.25%) and multi-family residential (1.54%) construction are projections based on the average growth rate for these housing types from recent U.S. Census data for Texas. Growth factors for wind energy are from the Texas Public Utilities Commission[38]. No growth was assumed for Federal buildings, pilot lights, PUC programs and SECO entries.

Figure 131 shows the overall information flow that was used to calculate the NOx emissions savings from the annual and Ozone Season Day (OSD) electricity savings (MWh) from all programs. For the Laboratory's single-family and multi-family code-implementation programs, the annual and ozone season savings were calculated from DOE-2 hourly simulation models[39]. The base case is taken as the average characteristics of single- and multi-family residences for Texas published by the National Association of Home Builders for 1999 (NAHB 1999). The OSD consumption is the average daily consumption for the period between July 15 and September 15, 1999.The annual electricity savings from PUC programs were calculated using deemed savings tables and spreadsheets created for the utilities incentive programs by Frontier Associates in Austin, Texas. (PUC 2007)

The SECO electricity savings were submitted as annual savings by project[40]. A description of the measures completed for the project was also submitted for information purposes. The electricity production from wind farms in Texas was from the actual on-site metered data measured at 15-minute intervals.

Integration of the savings from the different programs into a uniform format allowed for creditable NOx emissions to be evaluated using different criteria as shown in Table 87. These include evaluation across programs, evaluation across an individual counties by program, evaluation by SIP area, evaluation for all ERCOT counties except Houston/Galveston, and evaluation within a 200 km radius of Dallas/Ft.Worth.

8.3 Calculation Procedure

ESL Single-family and Multi-family. The calculation of the annual and OSD electricity savings reported for the years 2002 through 2007 included the savings from code-compliant new housing in all 41 non-attainment and affected counties as reported in the Laboratory's annual report submitted by the Laboratory to the Texas Commission of

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[37] A degradation of 5% per year would accumulate as a 5%, 10%, 15%...etc, degradation in performance. Although the assumption of this high level of degradation may not actually occur, it was chosen as a conservative estimate. For wind energy, a degradation factor of 0% was used. The choice of a 0% degradation factor for wind is based on two year's of analysis of measured wind data from all Texas wind farms that shows no degradation, on average, for a two year period after the wind farms became operational.

[38] The growth factors for wind energy through 2012 are based on permitted wind farms registered with the Texas Public Utilities Commission, http://www.puc.state.tx.us/electric/maps/gen_tables.xls. Growth factors for 2013 through 2020 assume a linear projection based on the permits for 2011 and 2012.

[39] These values are based on a performance analysis as defined by Chapter 4 of IECC 2000/2001. This analysis is discussed in the Laboratory's annual reports to the TCEQ.

[40] The reporting requirements to the SECO did not require energy savings by project type, although for selected sites, energy savings by project type was available. Annual savings were reported by SECO in 2004. Values for 2005 to 2007 use the adjusted values from 2004 as shown, www.seco.cpa.state.tx.us.

Environmental Quality (TCEQ). The savings for 2001 were also incorporated since some of the programs were reporting savings from September to December 2001. In 2005 to 2007 the annual and OSD electricity savings were calculated for new residential construction in all the counties in ERCOT region, which includes the 41 non-attainment and affected counties. These savings were then tabulated by county and program. Using the calculated values through 2007, savings were then projected to 2020 by incorporating the different adjustment factors mentioned above.

In these calculations it was assumed that the same amount of electricity savings from the code-complaint construction would be achieved for each year after 2007 through 2020[41]. The projected energy savings through 2020, according to county, were then divided into the different Power Control Authorities (PCA) in eGRID. To determine which PCA was to be used, or in counties with multiple PCA, the allocation to each PCA by county was obtained from PUC's listing published in the Laboratory's 2005 annual report[42].

For the 2007 annual and OSD NOx emissions calculations the US EPA's 2007 eGRID were used[43]. An example of the eGRID spreadsheet[44] is given in Table 88. The total electricity savings for each PCA were used to calculate the NOx emissions reduction for each of the different counties using the emissions factors contained in eGRID. Similar calculations were performed for each year for which the analysis was required. The cumulative NOx emissions reduction for the electricity savings from residential new construction for 2006 through 2020 is provided in Table 89.NOx emissions reduction is provided in Table 90.

ESL-Commercial Buildings. The annual and OSD electricity savings for 2002 through 2007 for commercial buildings were obtained from the annual reports for 2005 and 2007 submitted by the Laboratory to TCEQ[45]. These savings were also tabulated by county and program. Using the calculated values through 2007, savings were then projected to 2020 by incorporating the different adjustment factors mentioned above[46]. In the projected 2008 cumulative electricity savings was assumed that the same amount of electricity savings from 2007 would be achieved for each year after 2007 through 2020. Similarly to the single family calculations, the projected energy saving numbers through 2020, by county, were allocated into the appropriate Power Control Authorities (PCA).

Federal Buildings. Energy savings achieved from Energy Savings Performance Contracts (ESPCs) were also reported in 2007. This includes savings (estimated) from energy conservation measures implemented in Federal Buildings in Texas. The 2007 savings include projects implemented in 14 Federal buildings reported by the regional office of the Department of Energy. Annual kWh savings reported for each of the projects were divided by 365 to obtain the average Ozone Season Day savings[47]. In the calculation for 2007, it was assumed that the electricity savings from 2006 would also be achieved for each year from 2008 through 2020 after the appropriate degradation factors were applied. Similarly to the single family calculations, the projected energy saving numbers through 2020, by county, were proportioned into the PUC's Power Control Authorities (PCA) and the cumulative NOx emission reduction values calculated.

Furnace Pilot Light Program. For the furnace pilot light program savings, the N.G. energy savings achieved by retrofitting existing furnaces in single-family and multi-family residences for the entire residential stock for Texas have been projected until 2020. Pilot light removal saves an estimated 500 Btu/hr of natural gas for each hour of operation for the entire life of the furnace when the furnace is replaced with a code-compliant replacement. The energy savings for the Ozone Season Day are calculated by dividing the annual number by 365. It is also being assumed that of the total furnaces that were retrofitted, 75% are operational during the Ozone Season Period. Cumulative NOx emissions reduction for the N.G. savings from the removal of furnace pilot lights were also calculated by county for 2006 through 2020 by SIP area[48].

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[41] This would include the appropriate discount and degradation factors for each year.
[42] Haberl et al., 2005, pp. 197.
[43] This required two separate versions of the 2007 eGRID, which were specially prepared for Texas by Mr. Art Diem at the US EPA. One of the versions contains estimates of annual SOx, NOx and CO2 data for 2007, using a 25% capacity factor. The second version contains estimates of SOx, NOx and CO2 data for 2007 for an average day in the ozone season period, which runs from Mid July to Mid September.
[44] To use this spreadsheet electricity savings for each PCA is entered in the bottom row of the spreadsheet (MWh). The spreadsheet then allocates the MWh of electricity savings according to the counties (blue columns) where the PCA owned and operated a power plant. Totals for all PCAs are then listed on the far right columns (white columns). Similar spreadsheets for the 2007 eGRID exist for SOx and CO2.
[45] These savings include new construction in office, assembly, education, retail, food, lodging and warehouse construction as defined by Dodge building type (Dodge 2005), using energy savings from the Pacific Northwest National Laboratory (USDOE 2004), and data from CBECS (1995 - 2003).
[46] This also includes the appropriate discount and degradation factors for each year.
[47] This method yields suitable OSD values for lighting retrofits and/or retrofits that are not weather dependent. In the case of retrofits to cooling systems, weather normalization would increase the OSD savings substantially. Retrofits to heating systems would be reduced by weather normalization.
[48] These use the NOx/MBtu values provided in the US EPA AP 42 guideline.

PUC-Senate Bill 7. For the PUC Senate Bill 7 program savings, the annual electricity savings for 2001 through 2007 were obtained from the Public Utilities Commission[49]. Using these values savings were projected through 2020 by incorporating the different adjustment factors mentioned above. Similar savings were assumed for each year after 2008 until 2020. The 2007 annual and OSD eGRID was also used to calculate the NOx emissions savings for the PUC-Senate Bill 7 program. The total electricity savings for each PCA were used to calculate the NOx emissions reduction for each county using the emissions factors contained in the US EPA's eGRID spreadsheet. The cumulative NOx emissions reduction for each county by SIP area for the different programs was then calculated.

PUC-TERP Grants Program. To calculate the annual electricity savings from the PUC's TERP program, electricity savings were also obtained from the Public Utilities Commission[50]. The annual and average day electricity savings were then proportioned according to the PCA and program. Using the actual reported numbers through 2007, savings through 2020 were projected incorporating the different adjustment factors mentioned above[51]. The 2007 annual and OSD eGRID were used to calculate the NOx emissions savings for PUC-TERP Grants Program. The total electricity savings for each PCA were used to calculate the NOx emissions reduction for each of the different counties.

SECO Savings. The annual electricity savings from energy conservation projects reported by political subdivisions for 35 counties through 2007 were obtained from the State Energy Conservation Office[52]. These submittals included information gathered from SECO's website[53] and paper submittals[54]. The annual and average day electricity values where then summarized according to county and program. Using the actual reported numbers for 2004, savings through 2020 were projected using the different adjustment factors mentioned above. In a similar fashion as the previous programs it was assumed that the same amount of electricity savings will be achieved for each year after 2005 until 2020. The 2007 annual and OSD eGRID were then used to calculate the NOx emissions savings for the SECO program.

Electricity Generated by Wind Farms. The measured electricity production from all the wind farms in Texas for 2001 through 2007 was obtained from the Energy Reliability Council of Texas (ERCOT). To obtain the annual production, the 15-minute data were summed for the 12 months, while for the OSD period the data were converted to average daily electricity production during the months of July, August and September. Using the reported numbers for 2007, savings through 2020 were projected incorporating the different adjustment factors mentioned above. The 2007 annual and OSD eGRID were then used to calculate the NOx emissions reduction for the electricity generated by Texas' wind farms[55]. The total electricity savings for each PCA were used to calculate the NOx emissions reduction for each of the different counties

SEER 13 Single-Family and Multi-family. In January of 2006 Federal Regulations mandated that the minimum efficiency for residential air conditioners be increased to SEER 13 from the previous SEER 10. Although the electricity savings from new construction reflected this change in values, the annual and OSD electricity savings from the replacement of the air conditioning units by air conditioners with an efficiency of SEER 13 in existing residences needed to be calculated.

In the 2007 report to the TCEQ, the annual and OSD electricity savings for all the counties in ERCOT region as well as the 41 non-attainment and affected counties was calculated for the retrofit. Using the numbers for 2007, the savings through 2020 were projected by incorporating the appropriate adjustment factors[56]. In this analysis it was assumed that

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[49] In a similar fashion to the previous programs, to obtain the Ozone Season Day (OSD) savings, the annual electricity savings were divided by 365.

[50] In a similar fashion as the PUC's Senate Bill 7 program, the annual electricity savings numbers were then divided by 365 to get average electricity savings per day for OSD calculations. The preferred approach would be to weather-normalize the savings and then calculate savings for the OSD period. However, only annual values were obtained for the 2005 report to the TCEQ. Dividing the annual values by 365 is probably a reasonable approach for lighting projects. However, this undercounts potential savings from electric loads associated with the cooling season.

[51] Since the savings for the PUC's Senate Bill 5 were only reported for two years these savings actually reduced due to the imposed degradation factor.

[52] In a similar fashion as the PUC's Senate Bill 5 and 7 programs, these annual electricity savings numbers were divided by 365 to get average electricity savings per day for the OSD calculations.

[53] This web site was developed for SECO by the Laboratory, at the request of the TCEQ.

[54] In these submittals, there were several municipalities whose electricity or natural consumption increased in 2004 as compared to 2001, which caused the reported savings from these municipalities to be negative. Since no additional information was reported from these projects that might have indicated what the cause of this was, it was assumed that the energy conservation projects were working as designed, but that other factors had changed the energy consumption. Therefore, in the final values of electricity savings from the political subdivisions that reported to SECO for the calculation of annual and OSD NOx reductions, the negative savings were omitted.

[55] This credited the electricity generated by the wind farm to the utility that either owned the wind farm or was associated with the wind farm owner.

[56] Additional details about this calculation are contained in the Laboratory's 2006 Annual Report to the TCEQ, available at the Senate Bill 5 web site "eslsb5.tamu.edu".

an equal number of existing houses had their air conditioners replaced as reported for 2007 by the air conditioner manufacturers. This replacement rate continued until all the existing air conditioner stock was replaced with SEER 13 air conditioners. The total electricity savings for each PCA were used to calculate the NOx emissions reduction for each of the different county using the emissions factors contained in the 2007 eGRID. Cumulative NOx emissions reduction for each county by SIP area was also calculated.

8.4 Results

The total cumulative annual and OSD electricity savings for all the different programs in the integrated format was calculated using the adjustment factors for 2001 through 2020. NOx emissions reduction from the electricity and natural gas savings for the annual and OSD for all the programs in the integrated format is shown in Table 90. In Table 89 and Table 90 annual values are shown for 2005, and cumulative annual values are shown 2006 through 2020. The OSD NOx emissions reduction are also shown in Figure 132 as stacked bar charts and in Figure 133 for the individual components.

In 2007 the cumulative annual electricity savings[57] from code-compliant residential and commercial construction is calculated to be 1,440,885 MWh/year (11.4% of the total electricity savings), savings from retrofits to Federal buildings is 159,415 MWh/year (1.3%), savings from furnace pilot light retrofits is 2,548,904 MBtu/year, savings from the PUC's TERP and Senate Bill 7 programs is 1,598,054 MWh/year (12.7%), savings from SECO's TERP program is 353,701 MWh/year (2.8%), electricity savings from green power purchases (wind) is 8,362,335 MWh/year (66.4%), and savings from residential air conditioner retrofits[58] is 677,171 MWh/year (5.4%). The total savings from all programs is 12,591,561 MWh/year.

In 2007 the cumulative OSD electricity savings from code-compliant residential and commercial construction is calculated to be 7,979 MWh/day (21.3%), savings from retrofits to Federal buildings is 437 MWh/day (1.2%), savings from furnace pilot light retrofits is 6,983 MBtu/day, savings from the PUC's TERP and Senate Bill 7 programs is 4,378 MWh/day (11.7%), savings from SECO's TERP program is 969 MWh/day (2.6%), electricity savings from green power purchases (wind) are 18,856 MWh/day (50.4%), and savings from residential air conditioner retrofits are 4,803 MWh/day (12.8%). The total savings from all programs is 37,421 MWh/day, which would be a 1,559 MW average hourly load reduction during the OSD period.

By 2013 the cumulative annual electricity savings from code-compliant residential and commercial construction is calculated to be 2,930,748 MWh/year (10.2% of the total electricity savings), savings from retrofits to Federal buildings will be 402,732 MWh/year (1.4%), savings from furnace pilot light retrofits will remain at 2,548,904 MBtu/year, savings from the PUC's TERP and Senate Bill 7 programs will be 2,615,377 MWh/year (9.1%), savings from SECO's TERP program will be 447,285 MWh/year (1.5%), electricity savings from green power purchases (wind) will be 20,112,716 MWh/year (69.8%), and savings from residential air conditioner retrofits[59] will be 2,286,233 MWh/year (7.9%). The total savings from all programs will be 28,802,074 MWh/year.

By 2013 the cumulative OSD electricity savings from code-compliant residential and commercial construction is calculated to be 17,499 MWh/day (19.7%), savings from retrofits to Federal buildings will be 1,103 MWh/day (1.2%), savings from furnace pilot light retrofits will remain at 6,893 MBtu/day, savings from the PUC's TERP and Senate Bill 7 programs will be 7,166 MWh/day (8.1%), savings from SECO's TERP program will be 1,225 MWh/day (1.4%), electricity savings from green power purchases (wind) will be 45,351 MWh/day (51.2%), and savings from residential air conditioner retrofits will be 16,216 MWh/day (18.3%). The total savings from all programs will be 88,560 MWh/day, which would be a 3,690 MW average hourly load reduction during the OSD period.

In 2007 (Table 90) the cumulative annual NOx emissions reduction[60] from code-compliant residential and commercial construction is calculated to be 1,014 tons-NOx/year (12.2% of the total NOx savings), savings from retrofits to Federal buildings is 122 tons-NOx/year (1.4%), savings from furnace pilot light retrofits is 117 tons-NOx/year (1.4%), savings from the PUC's TERP and Senate Bill 7 programs is 1,125 tons-NOx/year (13.5%), savings from SECO's TERP program is 270 tons-NOx/year (3.2%), electricity savings from green power purchases (wind) is 5,211 tons-NOx/year (62.6%), and savings from residential air conditioner retrofits is 466 tons-NOx/year (5.6%). The total NOx emissions reduction from all programs is 8,326 tons-NOx/year.

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[57] This includes the savings from 2001 through 2007.
[58] This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.
[59] This assumes air conditioners in existing homes are replaced with the more efficient SEER 13 units, versus an average of SEER 11, which is slightly more efficient than the previous minimum standard of SEER 10.
[60] These NOx emissions reduction were calculated with the US EPA's 2007 eGRID for annual (25% capacity factor) and Ozone Season Day OSD.

In 2007 the cumulative OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 5.50 tons-NOx/day (21.9%), savings from retrofits to Federal buildings is 0.32 tons-NOx/day (1.2%), savings from furnace pilot light retrofits is 0.32 tons-NOx/day (1.2%), savings from the PUC's TERP and Senate Bill 7 programs is 3.33 tons-NOx/day (12.1%), savings from SECO's TERP program is 0.73 tons-NOx/day (2.9%), electricity savings from green power purchases (wind) are 11.88 tons-NOx/day (47.4%), and savings from residential air conditioner retrofits are 3.27 tons-NOx/day (13.1%). The total NOx emissions reduction from all programs is 25.05 tons-NOx/day.

By 2013 the cumulative NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 2,047 tons-NOx/year (10.9% of the total NOx savings), savings from retrofits to Federal buildings will be 308 tons-NOx/year (1.6%), savings from furnace pilot light retrofits will be 117 tons-NOx/year (0.6%), savings from the PUC's TERP and Senate Bill 7 programs will be 1,801 tons-NOx/year (9.6%), savings from SECO's TERP program will be 341 tons-NOx/year (1.8%), electricity savings from green power purchases (wind) will be 12,534 tons-NOx/year (66.9%), and savings from residential air conditioner retrofits will be 1,574 tons-NOx/year (8.4%). The total NOx emissions reduction from all programs will be 18,723 tons-NOx/year.

By 2013 the cumulative OSD NOx emissions reduction from code-compliant residential and commercial construction is calculated to be 11.96 tons-NOx/day (20.4%), savings from retrofits to Federal buildings will be 0.81 tons-NOx/day (1.4%), savings from furnace pilot light retrofits will be 0.32 tons-NOx/day (0.8 %), savings from the PUC's TERP and Senate Bill 7 programs will be 4.84 tons-NOx/day (8.3%), savings from SECO's TERP program will be 0.92 tons-NOx/day (1.6%), electricity savings from green power purchases (wind) will be 28.58 tons-NOx/day (48.8%), and savings from residential air conditioner retrofits will be 11.03 tons-NOx/day (18.8%). The total NOx emissions reduction from all programs will be 58.47 tons-NOx/day.

Table 87: Final Adjustment Factors used for the Calculation of the Annual and OSD NOx Savings for the Different Programs.

	ESL-Single Family[16]	ESL-Multifamily[16]	ESL-Commercial[16]	Federal Buildings[15]	Furnace Pilot Light Program[15]	PUC (SB7)[15]	PUC (SB5 Grant Program)[15]	SECO[15]	Wind-ERCOT[8]	SEER13 Single Family	SEER13 Multifamily
Annual Degradation Factor [11]	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	0.00%	5.00%	5.00%
T&D Loss [9]	7.00%	7.00%	7.00%	7.00%	0.00%	7.00%	7.00%	7.00%	0.00%	7.00%	7.00%
Initial Discount Factor [12]	20.00%	20.00%	20.00%	20.00%	20.00%	25.00%	25.00%	60.00%	25.00%	20.00%	20.00%
Growth Factor	3.25%	1.54%	3.25%	0.00%	0.00%	0.00%	0.00%	0.00%	Actual Rates	N.A.	N.A.
Weather Normalized	Yes	Yes	Yes	No	No	No	No	No	See note 7	Yes	Yes

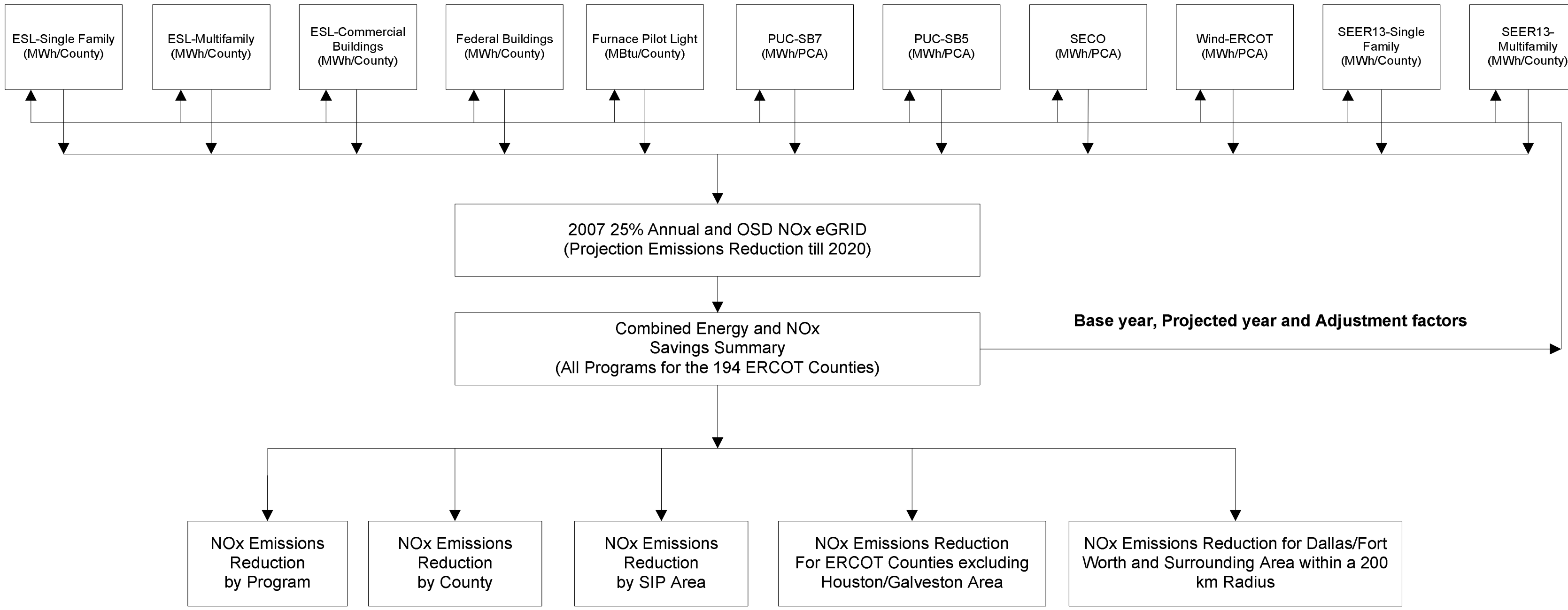

Figure 131: Process Flow Diagram of the NOx Emissions Reduction Calculations.

Table 88: Example of NOx Emissions Reduction Calculations using eGRID.

Area	County	American Electric Power - West (ERCOT) /PCA	NOx Reductions (lbs)	Austin Energy/PCA	NOx Reductions (lbs)	Brownsville Public Utils Board/PCA	NOx Reductions (lbs)	Lower Colorado River Auhotrity /PCA	NOx Reductions (lbs)	Reliant Energy HL&P/PCA	NOx Reductions (lbs)	San Antonio Public Service Bd/PCA	NOx Reductions (lbs)	South Texas Electric Coop INC/PCA	NOx Reductions (lbs)	Texas Municipal Power Pool/PCA	NOx Reductions (lbs)	Texas-New Mexico Power Co/PCA	NOx Reductions (lbs)	TXU Electric/PCA	NOx Reductions (lbs)	Total Nox Reductions (lbs)	Total Nox Reductions (Tons)
Houston-Galveston Area	Brazoria	0.008831132	226.0465792	0.010890729	8.193488679	0.006522185	0	0.003944232	14.32402746	0.065444292	3035.079423	0.014877434	272.3666894	0.006262315	0	0.004817148	0	0.121274957	139.7235344	0.00816387	940.7285451	4636.462287	2.318231144
	Chambers	0.021762222	557.0379581	0.026955801	20.27982242	0.016072371	0	0.009076193	32.96145962	0.164940225	7649.355979	0.037472294	686.0191605	0.015055623	0	0.009553214	0	0.011518588	13.2708178	0.015818592	1822.787617	10781.71281	5.390856407
	Fort Bend	0.070431234	1802.797078	0.087239726	65.63359654	0.052016606	0	0.029374182	106.6764342	0.533812376	24756.36787	0.121275295	2220.231709	0.048726002	0	0.030918012	0	0.037278747	42.94966114	0.051195276	5899.267979	34893.92432	17.44696216
	Galveston	0.033856739	866.6159501	0.041710519	31.3803294	0.025004711	0	0.015351589	55.75143316	0.249587379	11574.99759	0.056747051	1038.889275	0.024143087	0	0.019297151	0	0.567751219	654.118618	0.032836887	3783.817742	18005.57093	9.002785467
	Harris	0.068267332	1747.408655	0.084559408	63.61709594	0.050418468	0	0.028471701	103.3989497	0.517411736	23995.76304	0.117549281	2152.01819	0.047228963	0	0.029968099	0	0.03613341	41.63009278	0.049622373	5718.021208	33821.85723	16.91092861
	Liberty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Montgomery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Waller	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaumont/ Port Arthur Area	Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Jefferson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dallas/ Fort Worth Area	Collin	0.002039135	52.19483875	0.003716345	2.795940278	0.001505992	0	0.005950953	21.61171382	0.002481478	115.0823578	0.000717051	13.12731328	0.019166247	0	0.07668094	0	0.00086441	0.995905867	0.004000199	460.945804	666.7538738	0.333376937
	Dallas	0.004539471	116.1948312	0.004683963	3.523914222	0.003352602	0	0.00774211	28.1165509	0.002085611	96.72341896	0.00068106	12.46842352	0.007502816	0	0.026717045	0	0.007524933	8.669640256	0.040370454	4651.916039	4917.612818	2.458806409
	Denton	0.00047388	12.12970385	0.000872802	0.656640103	0.000349982	0	0.001396994	5.073377767	0.000585443	27.15083393	0.000168971	3.093405773	0.00454374	0	0.018187155	0	0.000186605	0.214992277	0.000849405	97.87758499	146.1965387	0.073098269
	Tarrant	0.012162492	311.3179263	0.012266309	9.228387517	0.008982543	0	0.020308652	73.75369976	0.005316504	246.5610524	0.001752506	32.08377752	0.017326428	0	0.060216761	0	0.020603444	23.73767965	0.110647237	12749.95959	13446.64211	6.723321056
	Ellis	0.003279814	83.95193355	0.003307809	2.488584531	0.002422289	0	0.005476558	19.88888265	0.001433682	66.48919108	0.000472592	8.651911537	0.004672353	0	0.016238427	0	0.005556053	6.401250735	0.029837824	3438.233618	3626.105373	1.813052686
	Johnson	0.000286058	7.322112154	0.000526868	0.396381687	0.000211267	0	0.000843297	3.062551359	0.000353404	16.38963767	0.000101999	1.867338584	0.002742835	0	0.010978701	0	0.000112645	0.129780379	0.000512745	59.08393672	88.25173856	0.044125869
	Kaufman	0.006325453	161.9098051	0.006379446	4.799487271	0.004671629	0	0.010562096	38.3577242	0.002765	128.2311379	0.000911441	16.68608752	0.009011105	0	0.031317452	0	0.010715411	12.34546025	0.057545265	6630.9817	6993.311403	3.496655701
	Parker	0.000217489	5.566981877	0.000400576	0.301367914	0.000160626	0	0.000641157	2.328449436	0.000268692	12.46099677	7.75498E-05	1.419732426	0.00208537	0	0.008347076	0	8.56434E-05	0.098671668	0.000389838	44.92135575	67.09755584	0.033548778
	Rockwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Henderson	0.000819895	20.98648722	0.000826893	0.622101782	0.000605529	0	0.001369042	4.971866208	0.000358395	16.62111282	0.00011814	2.162823693	0.001168005	0	0.004059317	0	0.001388914	1.600198603	0.007458924	859.4971295	906.4617199	0.45323086
	Hood	0.01252711	320.6508812	0.012634039	9.505044007	0.009251829	0	0.020917482	75.96475123	0.005475887	253.9526704	0.001805044	33.04561243	0.017845854	0	0.062021991	0	0.021221112	24.4493081	0.113964315	13132.18878	13849.75705	6.924878523
	Hunt	0.006187558	158.3801895	0.006240374	4.694858985	0.004569788	0	0.010331844	37.5215301	0.002704724	125.4357135	0.000891572	16.32233268	0.008814664	0	0.030634735	0	0.010481817	12.0763306	0.056290785	6486.427041	6840.857996	3.420428998
El Paso Area	El Paso	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Antonio Area	Bexar	0.033413751	855.276978	0.051775843	38.95283667	0.024677545	0	0.090663423	329.2568536	0.001141841	52.95463998	1.143571754	20935.7914	0.046873844	0	0.004669544	0	0.000519582	0.598622181	0.002503865	288.5221599	22501.3535	11.25067675
	Comal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Guadalupe	0.002000467	51.20507169	0.076378745	57.46248772	0.001477434	0	0.133848731	486.0903138	0.001237133	57.37392999	0.003554796	65.07897116	0.001061766	0	0.001855699	0	0.000401718	0.462828487	0.001835165	211.4673431	929.140946	0.464570473
	Wilson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Austin Area	Bastrop	0.004502334	115.2442433	0.171901148	129.3274415	0.003325174	0	0.301245466	1094.014881	0.002784342	129.1281298	0.008000571	146.4694129	0.002389654	0	0.004176513	0	0.000904124	1.041660856	0.004130298	475.937112	2091.162881	1.04558144
	Caldwell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hays	0.002458599	62.93167289	0.093870431	70.62211537	0.001815785	0	0.164501762	597.4110691	0.001520452	70.51327681	0.004368889	79.98286869	0.001304924	0	0.002280677	0	0.000493717	0.568821994	0.00225544	259.8960069	1141.925832	0.570962916
	Travis	0.000510007	13.05442349	0.299602906	225.4020851	0.000376663	0	0.033939476	123.2559365	0.000334709	15.52263338	0.000906121	16.58869273	0.000271138	0	0.000471744	0	0.000103327	0.119045148	0.000467336	53.85143207	447.7942484	0.223897124
	Williamson	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
North East Texas Area	Gregg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Harrison	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rusk	0.000685965	17.55833805	0.00069182	0.520481264	0.000506616	0	0.001145408	4.159710327	0.000299851	13.90604891	9.88414E-05	1.809525774	0.000977211	0	0.003396227	0	0.001162035	1.338805667	0.006240507	719.0980079	758.3909179	0.379195459
	Smith	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Upshur	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corpus Christi Area	Nueces	0.22756873	5824.975938	0.004556851	3.428283791	0.168069652	0	0.007612767	27.64682441	0.001680888	77.95375313	0.001626796	29.78235622	0.046792036	0	0.007246366	0	0.001609426	1.854254911	0.008283395	954.5014455	6920.142856	3.460071428
	San Patricio	0.050313351	1287.848557	0.001007478	0.757961986	0.037158653	0	0.001683113	6.112458369	0.000371629	17.2348572	0.00035967	6.584604794	0.010345288	0	0.001602105	0	0.000355829	0.409958691	0.001831382	211.0314828	1529.979881	0.76498994
Victoria Area	Victoria	0.021836736	558.9452467	0.002215582	1.666862472	0.016127403	0	0.003612695	13.12000619	0.001199621	55.63426979	0.000555389	10.16770824	0.52545648	0	0.032412721	0	0.000476855	0.549395481	0.002254849	259.8278678	899.9113567	0.449955678
Other ERCOT counties	Andrews	2.47421E-05	0.633312124	2.49533E-05	0.018773251	1.82731E-05	0	4.13138E-05	0.150036693	1.08153E-05	0.501577618	3.56511E-06	0.065267829	3.5247E-05	0	0.000122499	0	4.19135E-05	0.048289414	0.000225089	25.93716362	27.35442055	0.01367721
	Angelina	0.00031082	7.955919749	0.000313473	0.235837079	0.000229554	0	0.000519	1.884820844	0.000135867	6.301018286	4.47864E-05	0.81992053	0.000442787	0	0.001538876	0	0.000526534	0.606630902	0.002827658	325.8330045	343.6371519	0.171818576
	Bosque	0.000595392	15.23997933	0.001096604	0.825014503	0.000439723	0	0.001755208	6.374283599	0.000735562	34.11279889	0.000212298	3.88661097	0.005708837	0	0.02285067	0	0.000234455	0.270120186	0.001067208	122.9751683	183.6839758	0.091841988
	Brazos	0.001939725	49.65028649	0.003572622	2.687812467	0.001432574	0	0.005718288	20.7667609	0.002396384	111.1359931	0.000691644	12.66217912	0.018598805	0	0.074445136	0	0.000763829	0.880023807	0.003476855	400.6404605	598.4235164	0.299211758
	Calhoun	0.082699809	2116.830355	0.001655986	1.245858399	0.061077496	0	0.002766524	10.04701783	0.000610844	28.32885022	0.000591187	10.8230826	0.0170045	0	0.002633372	0	0.000584875	0.673847089	0.003010234	346.8714129	2514.820424	1.257410212
	Cameron	0.048371747	1238.150172	0.000968599	0.728712051	0.297964476	0	0.001618161	5.876577133	0.000357288	16.56975992	0.00034579	6.330503314	0.009946061	0	0.001540279	0	0.000342098	0.394138287	0.001760709	202.8877272	1470.93759	0.735468795
	Cherokee	0.003503899	89.68774747	0.003533808	2.658611083	0.002587786	0	0.00585073	21.24774271	0.001531635	71.03190513	0.00050488	9.243032581	0.00499158	0	0.017347879	0	0.005935657	6.838600793	0.031876422	3673.14266	3873.8503	1.93692515
	Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coleman	0.001298787	33.24447222	2.6007E-05	0.019566001	0.000959212	0	4.34478E-05	0.157786761	9.59321E-06	0.444899929	9.2845E-06	0.16997473	0.000267053	0	4.13567E-05	0	9.18536E-06	0.010582658	4.72752E-05	5.447558433	39.49484073	0.01974742
	Crockett	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ector	0.003535748	90.50296541	0.003565928	2.682776563	0.002611307	0	0.005903911	21.44087434	0.001545556	71.67755054	0.00050947	9.327047245	0.005036951	0	0.017505563	0	0.00598961	6.900760344	0.032166163	3706.529738	3909.061712	1.954530856
	Fannin	0.007056315	180.6173605	0.007116546	5.354034748	0.005211403	0	0.011782473	42.78969328	0.003084477	143.0473568	0.001016752	18.61404924	0.010052276	0	0.034935966	0	0.011953503	13.77189259	0.064194222	7397.14566	7801.340048	3.900670024
	Fayette	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Freestone	0.003677178	94.12308402	0.003708565	2.790087625	0.00271576	0	0.006140067	22.29850932	0.001607379	74.54465257	0.000529848	9.700129134	0.005238429	0	0.018205785	0	0.006229194	7.176790757	0.033452809	3854.790927	4065.42418	2.03271209
	Frio	0.008588335	219.8317964	0.000871383	0.655572927	0.006342868	0	0.001420864	5.160066298	0.000471808	21.88082203	0.000218433	3.998934744	0.206660746	0	0.012747844	0	0.000187546	0.216075897	0.000886827	102.189664	353.9329323	0.176966466
	Grimes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hardeman	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Haskell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hidalgo	0.188527456	4825.653746	0.003775086	2.840133709	0.139235931	0	0.006306735	22.9037859	0.001392518	64.58015017	0.001347706	24.6729498	0.03876448	0	0.006003193	0	0.001333316	1.536142338	0.006862311	790.7489276	5732.935836	2.866467918
	Howard	0.000555113	14.20898268	0.000559851	0.421196428	0.000409976	0	0.000926915	3.366221326	0.000242653	11.25338899	7.99868E-05	1.464348181	0.000790802	0	0.002748377	0	0.00094037	1.083420679	0.005050094	581.9258697	613.723428	0.306861714
	Jack	0.002121449	54.30177924	0.002139557	1.609665938	0.001566784	0	0.003542346	12.86452461	0.000927334	43.00653033	0.000305682	5.596228347	0.00302217	0	0.010503338	0	0.003593766	4.140456206	0.019299698	2223.917843	2345.437027	1.172718514
	Jones	0.040718722	1042.259088	0.000815354	0.613420549	0.030072592	0	0.001362147	4.946827986	0.00030076	13.94821343	0.000291082	5.32893728	0.008372468	0	0.001296587	0	0.000287974	0.331780603	0.001482142	170.7883116	1238.216579	0.61910829
	Lamar	0.000950838	24.33817497	0.000958954	0.721455757	0.000702236	0	0.001587687	5.765907769	0.000415633	19.27561996	0.000137007	2.508241656	0.001354543	0	0.004707619	0	0.001610734	1.855761432	0.008650166	996.7647898	1051.229951	0.525614976
	Limestone	0.000719757	18.42329542	0.000891528	0.670728366	0.000531572	0	0.000300183	1.090156782	0.00545518	252.9923553	0.001239347	22.68917849	0.000497945	0	0.00031596	0	0.000380962	0.438914787	0.000523179	60.28629516	356.5909243	0.178295462
	Llano	0.001238174	31.69299001	0.047274044	35.56597012	0.000914447	0	0.082844655	300.8619059	0.000765714	35.51115798	0.002200214	40.28013466	0.000657172	0	0.001148571	0	0.000248641	0.286464175	0.001135861	130.8861051	575.0847279	0.287542364
	McLennan	0.024534317	627.9940467	0.024743738	18.61560781	0.018119687	0	0.040966843	148.7767984	0.010724513	497.3657473	0.003535175	64.71975936	0.034951066	0	0.121469933	0	0.041561501	47.88391622	0.22319886	25719.36288	27124.71876	13.56235938
	Milam	0.002245405	57.4746346	0.002264571	1.703718789	0.001658332	0	0.003749326	13.61619935	0.000981518	45.51940379	0.000323543	5.923216216	0.003198756	0	0.011117048	0	0.00380375	4.382383245	0.02042738	2353.86146	2482.481016	1.241240508
	Mitchell	0.014943169	382.493668	0.015070721	11.3382478	0.011036196	0	0.024951762	90.61580067	0.006532002	302.9316123	0.002153177	39.41900132	0.02128772	0	0.07398395	0	0.025313952	29.16475857	0.135944204	15664.94698	16520.91007	8.260455036
	Nolan	0.000564654	14.45319062	0.000569473	0.428435476	0.000417022	0	0.000942846	3.424076134	0.000246823	11.44679952	8.13615E-05	1.489515743	0.000804394	0	0.002795613	0	0.000956532	1.102041289	0.005136889	591.9273539	624.2714127	0.312135706
	Palo Pinto	0.003206998	82.08811543	0.005906709	4.443830552	0.002368511	0	0.009454195	34.33422818	0.003962005	183.7440401	0.001143513	20.93471146	0.030749889	0	0.123082087	0	0.001262858	1.454966345	0.005748375	662.3893373	989.3892293	0.494694615
	Pecos	4.09677E-05	1.048631523	4.13174E-05	0.031084551	3.02565E-05	0	6.84069E-05	0.248429171	1.79079E-05	0.830506919	5.90308E-06	0.108069782	5.83617E-05	0	0.000202832	0	6.93999E-05	0.079957102	0.0003727	42.94648142	45.29316047	0.02264658
	Presidio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Robertson	0.000737708	18.88277792	0.000835096	0.628273174	0.00054483	0	0.000735917	2.67258533	0.003149678	146.0711407	0.000730875	13.38040458	0.00076086	0	0.001866305	0	0.191632518	220.7840225	0.003397737	391.5236901	793.9428943	0.396971447
	Taylor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Titus	0.005696437	145.8091831	0.005745061	4.322217039	0.004207073	0	0.009511781	34.54335843	0.002490043	115.4795873	0.000820806	15.02679093	0.008115023	0	0.028203184	0	0.00964985	11.11780398	0.051822854	5971.584145	6297.883086	3.148941543
	Tom Green	0.001482448	37.94556586	2.96846E-05	0.022332825	0.001094854	0	4.95918E-05	0.180099353	1.09498E-05	0.507813132	1.05974E-05	0.19401082	0.000304817	0	4.72049E-05	0	1.04843E-05	0.012079149	5.39604E-05	6.217896494	45.07979763	0.022539899
	Upton	3.11661E-05	0.797745539	3.14322E-05	0.023647546	2.30176E-05	0	5.20405E-05	0.188992281	1.36234E-05	0.631807433	4.49076E-06	0.082213995	4.43986E-05	0	0.000154304	0	5.27959E-05	0.060827297	0.000283531	32.67149923	34.45673333	0.017228367
	Ward	0.018559529	475.0600294	0.01871795	14.08218954	0.013707039	0	0.030990277	112.54551	0.008112796	376.2433542	0.002674262	48.95869786	0.026439509	0	0.091888626	0	0.03144012	36.22285079	0.16884373	19455.98267	20519.0953	10.25954765
	Webb	0.020014327	512.2978652	0.000400768	0.301512399	0.014781473	0	0.000669531	2.431496589	0.000147832	6.855915242	0.000143074	2.619313398	0.004115289	0	0.000637307	0	0.000141547	0.163078928	0.000728512	83.94696529	608.6161471	0.304308074
	Wharton	0.00014434	3.694599265	0.000178787	0.134507561	0.000106601	0	6.01986E-05	0.218619544	0.001093979	50.7349716	0.000248538	4.550077512	9.98576E-05	0	6.33625E-05	0	7.6398E-05	0.088019771	0.000104918	12.08978615	71.5105814	0.035755291
	Wichita	0.000207633	5.314695266	0.000209406	0.157543345	0.000153346	0	0.000346701	1.259093698	9.07612E-05	4.209191786	2.99181E-05	0.547721432	0.00029579	0	0.001027996	0	0.000351734	0.405240184	0.001888925	217.6622165	229.5557022	0.114777851
	Wilbarger	0.028616818	732.4920115	0.000573025	0.431104744	0.021134796	0	0.000957307	3.476594279	0.000211372	9.802701684	0.00020457	3.745137877	0.005884109	0	0.000911232	0	0.000202386	0.233172965	0.001041639	120.0287677	870.2094935	0.435104747
	Wise	0.002844488	72.80908734	0.002882008	2.16823872	0.002100781	0	0.00476997	17.32281236	0.001256075	58.25242144	0.000413241	7.565361234	0.00418191	0	0.014614274	0	0.004797945	5.527817073	0.025761411	2968.505674	3132.151412	1.566075706
	Young	0.006235856	159.6164509	0.006289085	4.731505443	0.004605458	0	0.010412491	37.81441029	0.002725836	126.4148216	0.000898531	16.44979321	0.008883468	0	0.030873859	0	0.010563634	12.17059429	0.056730171	6537.057865	6894.255386	3.447127693
	Total	**1.121837219**	**28715.17018**	**1.172570094**	**882.1668247**	**1.090766584**	**0**	**1.189130767**	**4318.494059**	**1.629360006**	**75564.06999**	**1.542362643**	**28236.60382**	**1.359385821**	**0**	**1.231642808**	**0**	**1.221806085**	**1407.669558**	**1.528786947**	**176163.2035**	**315287.3779**	**157.643689**
Energy Savings by PCA (MWh)		25,597		752		0		3,632		46,377		18,307		0		0		1,152		115,231			

Table 89: Annual and OSD Electricity Savings for the Different Programs.

Program	2005 Annual (MWh)	Cumulative 2006 Annual (MWh)	Cumulative 2007 Annual (MWh)	Cumulative 2008 Annual (MWh)	Cumulative 2009 Annual (MWh)	Cumulative 2010 Annual (MWh)	Cumulative 2011 Annual (MWh)	Cumulative 2012 Annual (MWh)	Cumulative 2013 Annual (MWh)	Cumulative 2014 Annual (MWh)	Cumulative 2015 Annual (MWh)	Cumulative 2016 Annual (MWh)	Cumulative 2017 Annual (MWh)	Cumulative 2018 Annual (MWh)	Cumulative 2019 Annual (MWh)	Cumulative 2020 Annual (MWh)
ESL-Single Family	225,389	1,001,051	1,197,537	1,389,628	1,576,914	1,758,988	1,935,443	2,105,869	2,269,858	2,427,002	2,576,894	2,719,125	2,853,286	2,978,970	3,095,768	3,203,273
ESL-Multifamily	9,228	37,821	51,312	64,266	76,670	88,513	99,783	110,468	120,555	130,032	138,889	147,113	154,691	161,612	167,865	173,436
ESL-Commercial	63,456	129,063	192,036	253,790	314,214	373,193	430,615	486,367	540,335	592,407	642,470	690,410	736,114	779,469	820,362	858,680
Federal Buildings	52,276	109,073	159,415	206,960	251,708	293,659	332,813	369,171	402,732	433,496	461,464	486,635	509,009	528,586	545,366	559,350
Furnace Pilot Light Program	2,209,050	2,548,904	6,983	2,548,904	6,983	2,548,904	6,983	2,548,904	6,983	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904	2,548,904
PUC (SB7)	302,192	1,362,701	1,585,227	1,792,849	1,985,566	2,163,378	2,326,285	2,474,288	2,607,386	2,725,579	2,828,867	2,917,251	2,990,730	3,049,304	3,092,973	3,121,738
PUC (SB5 grant program)	0	13,633	12,827	12,021	11,215	10,409	9,603	8,797	7,991	7,186	6,380	5,574	4,768	3,962	3,156	2,350
SECO	115,360	293,764	353,701	389,150	404,524	418,025	429,652	439,405	447,285	453,292	457,425	459,684	460,070	458,582	455,220	449,985
Wind-ERCOT	2,867,049	6,376,678	8,362,335	12,722,008	16,867,714	18,517,389	18,947,739	19,521,539	20,112,716	20,721,795	21,349,319	21,995,847	22,661,954	23,348,233	24,055,294	24,783,768
SEER13-Single Famil	0	374,246	624,639	913,010	1,185,311	1,441,594	1,681,860	1,906,108	2,114,339	2,306,551	2,482,746	2,642,923	2,787,083	2,915,224	2,803,568	2,590,509
SEER13-Multifamily	0	31,634	52,532	76,375	98,620	119,281	138,371	155,904	171,894	186,354	199,298	210,738	220,690	229,165	219,722	202,900
	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)	OSD (MWh)
ESL-Single Family	776	5,537	6,519	7,702	8,857	10,157	11,235	12,276	13,279	14,241	15,160	16,034	16,859	17,633	18,355	19,021
ESL-Multifamily	36	192	271	355	434	517	589	658	723	784	841	895	944	989	1,031	1,068
ESL-Commercial	0	800	1,189	1,595	1,992	2,401	2,777	3,143	3,497	3,839	4,167	4,482	4,782	5,067	5,336	5,588
Federal Buildings	0	299	437	567	690	805	912	1,011	1,103	1,188	1,264	1,333	1,395	1,448	1,494	1,532
Furnace Pilot Lt Prog. (Mbtu)	5,819	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983
PUC (SB7)	828	3,733	4,343	4,912	5,440	5,927	6,373	6,779	7,144	7,467	7,750	7,992	8,194	8,354	8,474	8,553
PUC (SB5 grant program)	0	37	35	33	31	29	26	24	22	20	17	15	13	11	9	6
SECO	316	805	969	1,066	1,108	1,145	1,177	1,204	1,225	1,242	1,253	1,259	1,260	1,256	1,247	1,233
Wind-ERCOT	5,836	13,740	18,856	28,686	38,034	41,754	42,724	44,018	45,351	46,724	48,139	49,597	51,099	52,647	54,241	55,884
SEER13-Single Famil	0	2,666	4,449	6,503	8,442	10,268	11,979	13,576	15,059	16,428	17,683	18,824	19,851	20,764	19,969	18,451
SEER13-Multifamily	0	213	354	514	664	803	931	1,049	1,157	1,254	1,341	1,418	1,485	1,542	1,479	1,365
Total Ann (MWh)	5,843,999	12,278,567	12,598,545	20,368,960	22,779,439	27,733,334	26,339,148	30,126,820	28,802,074	32,532,599	33,692,655	34,824,202	35,927,296	37,002,010	37,808,199	38,494,893
Total OSD (MWh)	7,791	28,023	37,421	51,933	65,693	73,805	78,724	83,739	88,560	93,187	97,618	101,850	105,882	109,712	111,633	112,701
Total OSD (Mbtu)	5,819	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983	6,983

Table 90: Annual and OSD NOx Emissions Reduction Values for the Different Programs.

Program	2005 Annual (Tons)	Cum. 2006 Annual (Tons)	Cum. 2007 Annual (Tons)	Cum. 2008 Annual (Tons)	Cum. 2009 Annual (Tons)	Cum. 2010 Annual (Tons)	Cum. 2011 Annual (Tons)	Cum. 2012 Annual (Tons)	Cum. 2013 Annual (Tons)	Cum. 2014 Annual (Tons)	Cum. 2015 Annual (Tons)	Cum. 2016 Annual (Tons)	Cum. 2017 Annual (Tons)	Cum. 2018 Annual (Tons)	Cum. 2019 Annual (Tons)	Cum. 2020 Annual (Tons)
ESL-Single Family	158	708	843	975	1,103	1,228	1,349	1,466	1,579	1,687	1,790	1,887	1,979	2,065	2,145	2,218
ESL-Multifamily	6	26	35	44	53	61	69	76	83	90	96	101	107	111	116	120
ESL-Commercial	44	90	136	180	223	265	307	347	385	423	459	493	526	557	586	614
Federal Buildings	40	84	122	158	193	225	255	283	308	332	353	373	390	405	418	428
Furnace Pilot Light Program	102	117	117	117	117	117	117	117	117	117	117	117	0	0	0	0
PUC (SB7)	237	1,074	1,120	1,259	1,387	1,504	1,612	1,710	1,798	1,875	1,942	2,000	2,047	2,084	2,111	2,300
PUC (SB5 grant program)	0	6	5	5	5	4	4	4	3	3	3	2	2	2	1	1
SECO	67	224	270	297	308	319	328	335	341	346	349	350	351	350	347	343
Wind-ERCOT	2,465	3,971	5,211	7,928	10,511	11,539	11,808	12,165	12,534	12,913	13,304	13,707	14,122	14,550	14,990	15,444
SEER13-Single Family	0	258	430	629	816	993	1,158	1,313	1,456	1,589	1,710	1,820	1,920	2,008	1,931	1,784
SEER13-Multifamily	0	22	36	53	68	82	95	107	118	128	137	145	152	158	151	140
	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)	OSD (Tons)
ESL-Single Family	0.76	3.85	4.50	5.30	6.07	6.95	7.68	8.38	9.05	9.70	10.31	10.90	11.45	11.97	12.45	12.90
ESL-Multifamily	0.03	0.13	0.18	0.24	0.30	0.35	0.40	0.45	0.49	0.53	0.57	0.61	0.64	0.67	0.70	0.73
ESL-Commercial	0.26	0.55	0.82	1.10	1.38	1.66	1.92	2.17	2.42	2.65	2.88	3.10	3.31	3.51	3.69	3.87
Federal Buildings	0.11	0.22	0.32	0.42	0.51	0.59	0.67	0.74	0.81	0.87	0.93	0.98	1.02	1.06	1.10	1.12
Furnace Pilot Light Program	0.28	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.00	0.00	0.00	0.00
PUC (SB7)	0.64	2.61	3.01	3.38	3.73	4.04	4.33	4.60	4.83	5.04	5.22	5.38	5.50	5.60	5.68	5.72
PUC (SB5 grant program)	0.00	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
SECO	0.18	0.61	0.73	0.80	0.84	0.86	0.89	0.91	0.92	0.94	0.95	0.95	0.95	0.95	0.94	0.93
Wind-ERCOT	5.85	8.59	11.88	18.08	23.97	26.31	26.92	27.74	28.58	29.44	30.34	31.26	32.20	33.18	34.18	35.22
SEER13-Single Family	0.00	1.81	3.03	4.42	5.74	6.98	8.15	9.23	10.24	11.17	12.03	12.80	13.50	14.12	13.58	12.55
SEER13-Multifamily	0.00	0.15	0.24	0.35	0.45	0.55	0.63	0.71	0.79	0.85	0.91	0.97	1.01	1.05	1.01	0.93
Total Ann	3,119	6,579	8,326	11,644	14,785	16,339	17,102	17,923	18,723	19,502	20,260	20,996	21,594	22,289	22,796	23,392
Total OSD	8.09	18.85	25.05	34.42	43.31	48.64	51.92	55.26	58.47	61.54	64.47	67.26	69.60	72.12	73.33	73.97

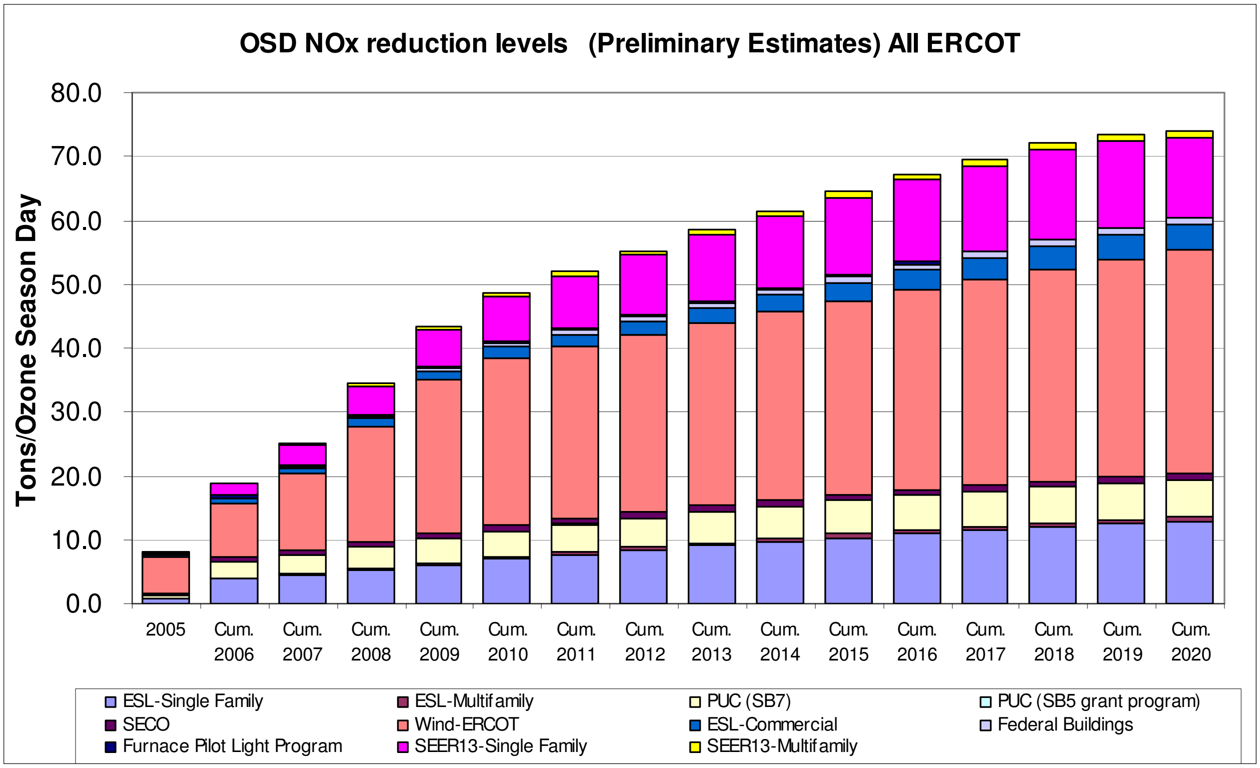

Figure 132: Cumulative OSD NOx Emissions Reduction Projections through 2020.

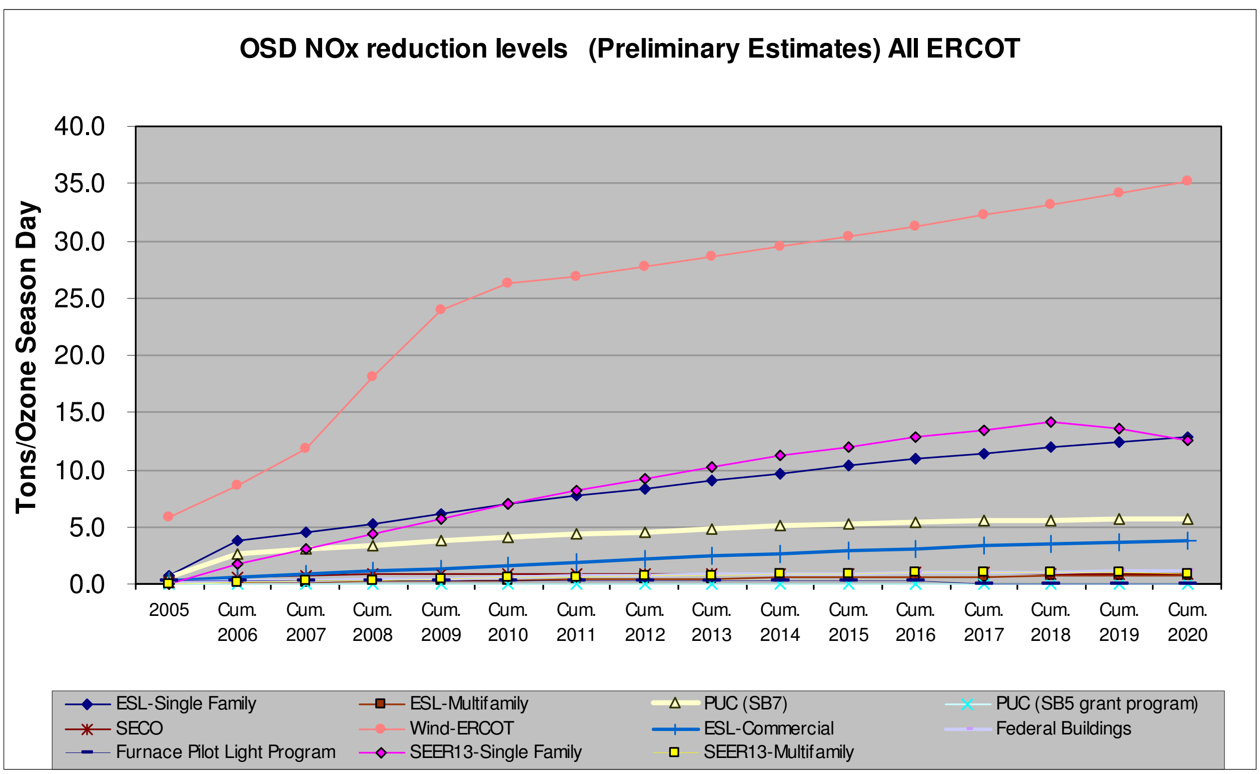

Figure 133: Cumulative OSD NOx Emissions Reduction Projections through 2020

8.5 Weather Data.

In order to calculate the NOx emissions from energy efficiency and renewable energy (EE/RE) projects in non-attainment and affected counties in Texas (Figure 134) several weather data sets needed to be assembled from the many different weather sources (Figure 135 and Table 91), including hourly weather data sets needed for the DOE-2 simulations and daily average weather data for analysis that used monthly utility billing data. In 2007 these sources were updated.

In the archive the counties were grouped according to the nearest TMY2 weather station as shown in Table 92. Next, for each group, weather files were determined for F-CHART, PV F-CHART, ASHRAE 90.1-1989, and ASHRAE 90.1-1999 analysis. Finally, as shown in Table 93, weather files were assigned for NOAA data (temperature, humidity, wind speed) and NREL (solar radiation). In some instances, where solar radiation data were not available from the NREL database, TCEQ solar data were used. For NREL solar sources, solar data included global horizontal, direct normal beam, and diffuse solar radiation. For TCEQ solar sources, only global horizontal solar radiation data were available which required synthesis of direct normal beam and diffuse radiation using an iterative kt procedure (Erbs 1982). Synthetic beam and diffuse solar data were also used to fill missing NREL data.

In 2005, at the request of the TCEQ, the 9 weather stations assembled for calculating emissions from the non-attainment and affected counties were expanded to include all counties in ERCOT. To accomplish this, 8 additional weather stations were added to the original 9 stations for a total of 17 weather stations (Table 94). Assignment of weather stations was then performed as shown in Table 95, with additional details provided in Table 96. Figure 136 shows an updated map of Texas showing the available weather files, 2000/2001 IECC weather zones, and ERCOT county outline. Figure 137 shows the clustering of the counties around their chosen TMY2 and NOAA weather stations. Figure 138 shows the 2000/2001 and 2006 IECC weather zones and available weather files. During the period from January 2006 to June 2007, the Laboratory maintained and added additional years of weather data to the archive.

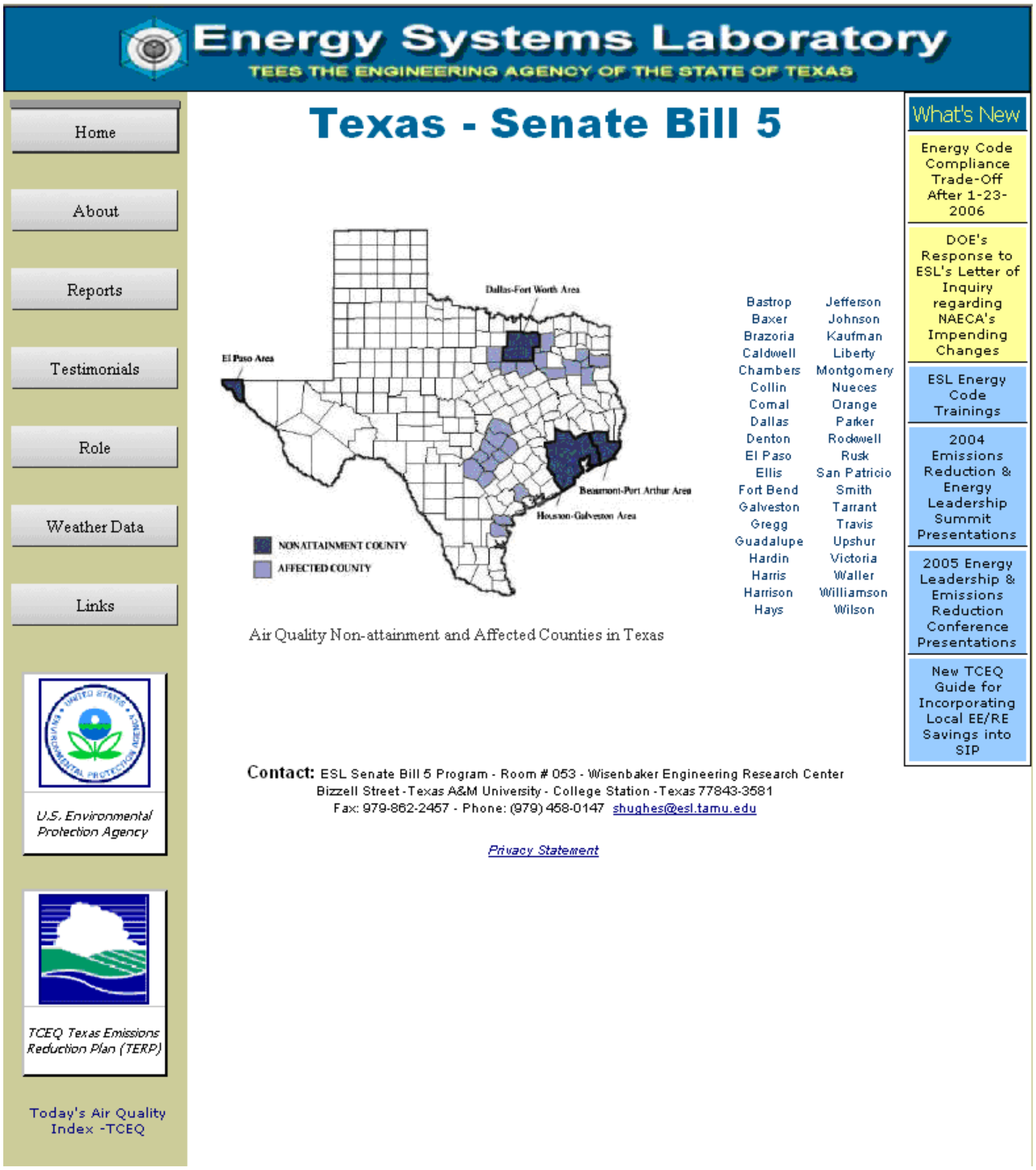

Figure 134: Main Screen of the TERP Web Page Showing the New Weather Data Button.

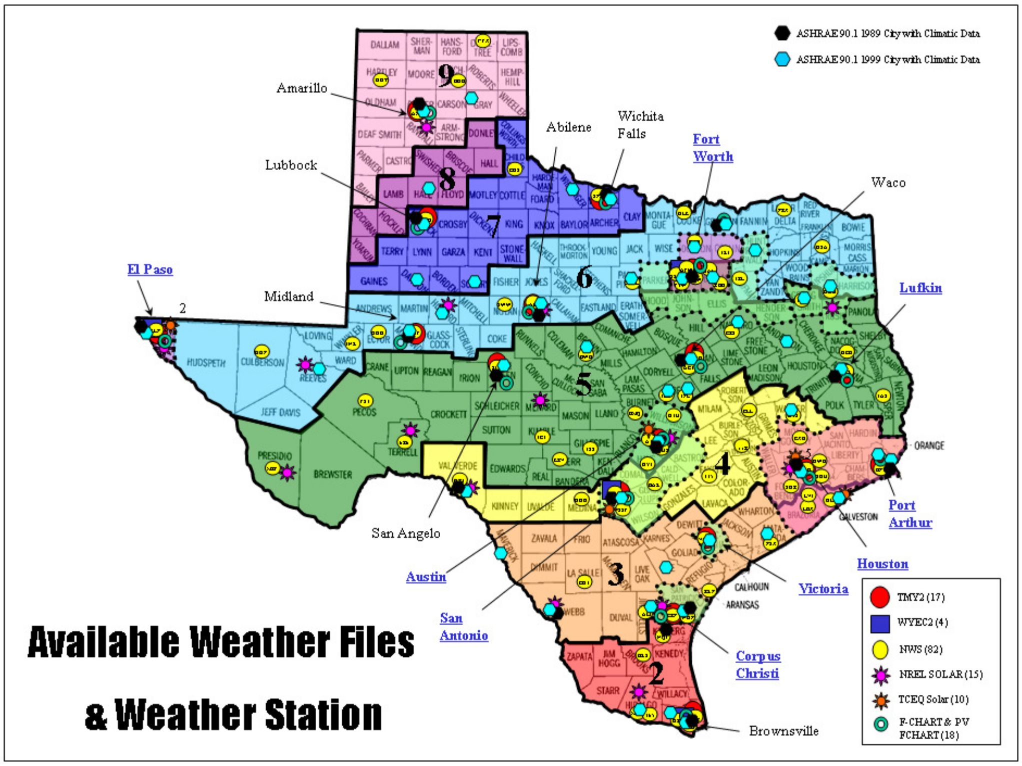

Figure 135: Available Weather Stations in Texas for 41 Non-attainment and Affected Counties.

Table 91: List of Available Weather Files in Texas (Listed by Symbol).

List of Available Weather Files and Weather Stations of Texas

Texas Weather Stations (NOAA)

1 Abilene Regional Airport (ABI)
2 Alice International Airport (ALI)
3 Amarillo International Airport (AMA)
4 Angleton / Lake Jackson Brazori (LBX)
5 Arlington Municipal Airport (GKY)
6 Austin - Bergstrom International (AUS)
7 Austin Camp Mabry (ATT)
8 Borger Hutchinson County Airport (BGD)
9 BRENHAM: BRENHAM MUNICIPAL AIRPORT (11R)
10 Brownsville S Padre Isl International (BRO)
11 BROWNWOOD: BROWNWOOD REGIONAL AIRPORT (BWD)
12 Burnet Municipal Airport (BMQ)
13 Childress Municipal Airport (CDS)
14 College Station (CLL)
15 Conroe Montgomery County Airport (CXO)
16 Corpus Christi International Airport (CRP)
17 CORPUS CHRISTI: CORPUS CHRISTI NAS/TRUAX FIELD ARPT (NGP)
18 Corsicana Campbell Field (CRS)
19 Cotulla La Salle Co Airport (COT)
20 Dalhart Municipal Airport (DHT)
21 Dallas - Fort Worth International Airport (DFW)
22 Dallas Love Field (DAL)
23 Dallas Redbird Airport (RBD)
24 Del Rio International Airport (DRT)
25 Denton Municipal Airport (DTO)
26 Dryden Terrell County Airport (6R6)
27 El Paso International Airport (ELP)
28 FALFURRIAS: BROOKS COUNTY AIRPORT (BKS)
29 Fort Stockton Pecos County Airport (FST)
30 Fort Worth Alliance Airport (AFW)
31 Fort Worth Meacham (FTW)
32 FREDERICKSBURG: GILLESPIE COUNTY AIRPORT (T82)
33 GAINESVILLE: GAINESVILLE MUNICIPAL AIRPORT (GLE)
34 Galveston Scholes Field (GLS)
35 GEORGETOWN: GEORGETOWN MUNICIPAL AIRPORT (GTU)
36 Harlingen Rio Grande Valley I (HRL)
37 Hondo Municipal Airport (HDO)
38 Houston Bush Intercontinental (IAH)
39 Houston Clover Field (LVJ)
40 Houston Hooks Memorial Airport (DWH)
41 Houston Sugarland Mem (SGR)
42 Houston William P Hobby Airport (HOU)
43 Huntsville Municipal Airport (UTS)
44 JASPER: JASPER COUNTY-BELL FIELD AIRPORT (JAS)
45 Junction Kimble County Airport (JCT)
46 KERRVILLE: KERRVILLE MUNI/LOUIS SCHREINER FLD AIRPORT (ERV)
47 KILLEEN: KILLEEN MUNICIPAL AIRPORT (ILE)
48 KINGSVILLE: KINGSVILLE NAS AIRPORT (NQI)
49 LA GRANGE: FAYETTE REGIONAL AIR CENTER AIRPORT (3T5)
50 Longview E Tx Rgnl Airport (GGG)
51 Lubbock International Airport (LBB)
52 Lufkin Angelina Cty Airport (LFK)
53 MARFA: MARFA MUNICIPAL AIRPORT (MRF)
54 McAllen Miller International Airport (MFE)
55 McKinney Municipal Airport (TKI)
56 Midland International Airport (MAF)
57 Mineral Wells Airport (MWL)
58 MOUNT PLEASANT: MOUNT PLEASANT REGIONAL AIRPORT (OSA)
59 NACOGDOCHES: A L MANGHAM JR REGIONAL AIRPORT (OCH)
60 New Braunfels Municipal Airport (BAZ)
61 Odessa Schlemeyer Field (ODO)
62 Palacios Municipal Airport (PSX)
63 PARIS: COX FIELD AIRPORT (PRX)
64 PERRYTON: PERRYTON OCHILTREE COUNTY AIRPORT (PYX)
65 Pine Springs Guadalupe Mounta (GDP)
66 Port Arthur Se Tx Rgnl Airport (BPT)
67 Port Isabel Cameron County Airport (PIL)
68 Rockport Aransas Co Airport (RKP)
69 San Angelo Mathis Field (SJT)
70 San Antonio International Airport (SAT)
71 San Antonio Stinson Municipal Airport (SSF)
72 SAN MARCOS: SAN MARCOS MUNICIPAL AIRPORT (HYI)
73 SWEETWATER: AVENGER FIELD AIRPORT (SWW)
74 TEMPLE: DRAUGHON-MILLER CNTRL TEXAS REGIONAL ARPT (TPL)
75 Terrell Municipal Airport (TRL)
76 Tyler Pounds Field (TYR)
77 Victoria Regional Airport (VCT)
78 WACO: MC GREGOR EXECUTIVE AIRPORT (PWG)
79 Waco Regional Airport (ACT)
80 WESLACO: MID VALLEY AIRPORT (T65)
81 Wichita Falls Municipal Airport (SPS)
82 Wink Winkler Co Airport (INK)

Texas TMY2 Weather Files

1 Abilene
2 Amarillo
3 Austin
4 Brownsville
5 Corpus Christi
6 El Paso
7 Fort Worth
8 Houston
9 Lubbock
10 Lufkin
11 Midland
12 Port Arthur
13 San Angelo
14 San Antonio
15 Victoria
16 Waco
17 Wichita Falls

Texas WYEC2 Weather Files

1 El Paso
2 Brownsville
3 Fort Worth
4 San Antonio

NREL Solar Stations

1 Abilene
2 Austin
3 Big Spring
4 Canyon
5 Clear Lake
6 Corpus Christi
7 Del Rio
8 Edinburg
9 El Paso
10 Laredo
11 Menard
12 Overton
13 Pecos
14 Presidio
15 Sanderson

TCEQ Solar Stations

1 Bexar
2 Travis
3 El Paso (2)
4 Galveston
5 Harris (5)

FCHART and PV FCHART (New Weather File)

1 ABILENE
2 AMARILLO
3 AUSTIN
4 BROWNSVILLE
5 CORPUS CHRISTI
6 EL PASO
7 FORT WORTH
8 HOUSTON
9 LUBBOCK
10 LUFKIN
11 MIDLAND-ODESSA
12 PORT ARTHUR
13 SAN ANGELO
14 SAN ANTONIO
15 SHERMAN
16 VICTORIA
17 WACO
18 WICHITA FALLS

Table 92: Assignment of Weather Stations for 41 Non-attainment and Affected Counties (NOAA, TMY2, F-CHART, PV F-CHART, NAHB, Climate Zone, HDD, CDD, 90.1-1989, 90.1-1999).

Area	No.	County	NOAA Weather Station		Solar Station		TMY2		FCHART		PV-FCHART		DOE Include File	Weather File	DOE TRY weather file name	East or West Texas	Climate Zone	HDD		CDD		AHSRAE 90.1-1989		AHSRAE 90.1-1999		County
			WBAN No.	Weather Station	Source	File	WBAN No.	File										1989	1999	1989	1999	Nearest City	Table 8A (10, 12, 16)	Nearest City	Table B (5, 6, 8, 10)	
	ID	County	WBAN No.	Weather Station	x	x	x	TMY2File	Fchart	FchartID	PVFChart	PVFChartID	DOE_INC	x	DOE_WF	PRECODE	CZ									County
Austin	22	Bastrop	13958	Austin Camp Mabry (ATT)	NREL	Austin	13958	Austin	Austin	14	Austin	18	BAS	Austin	ATT	West	4					Austin	12	Austin	6	Bastrop
	26	Caldwell	13958	Austin Camp Mabry (ATT)	NREL	Austin	13958	Austin	Austin	14	Austin	18	CAL	Austin	ATT	West	4					Austin	12	Austin	6	Caldwell
	8	Hays	13958	Austin Camp Mabry (ATT)	NREL	Austin	13958	Austin	Austin	14	Austin	18	HAY	Austin	ATT	West	5					Austin	12	Austin	6	Hays
	40	Travis	13958	Austin Camp Mabry (ATT)	NREL	Austin	13958	Austin	Austin	14	Austin	18	TRA	Austin	ATT	West	5	1735	1688	6873	7171	Austin	12	Austin	6	Travis
	41	Williamson	13958	Austin Camp Mabry (ATT)	NREL	Austin	13958	Austin	Austin	14	Austin	18	WLL	Austin	ATT	West	5					Austin	12	Kileen/Robert-gray or **Austin**	6	Williamson
Corpus	38	Nueces	12924	Corpus Christi International Airport (CRP)	NREL	Corpus Christi	12924	Corpus Christi	Corpus Christi	52	Corpus Christi	58	NUE	Corpus Christi	CRP	East	3	889	1016	8200	8023	Corpus Christi	16	Corpus Christi or Alice	5	Nueces
	15	San Patricio	12924	Corpus Christi International Airport (CRP)	NREL	Corpus Christi	12924	Corpus Christi	Corpus Christi	52	Corpus Christi	58	SAP	Corpus Christi	CRP	East	3					Corpus Christi	16	Corpus Christi or Alice	5	San Patricio
El Paso	30	El Paso	23044	El Paso International Airport (ELP)	TCEQ	C12-El Paso UTEP	23044	El Paso	El Paso	68	El Paso	70	ELP	El Paso	ELP	West	6	2605	2708	5617	5488	El Paso	12	El Paso	10	El Paso
Dallas-Ft. Worth	27	Collin	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	COL	Fort Worth	DFW	West	6					Sherman or Fort Worth	12	**Denton,** Greenville or Sherman	8	Collin
	4	Dallas	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	DAL	Fort Worth	DFW	West	5		2259		6587	Fort Worth	12	Dallas	8	Dallas
	29	Denton	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	DEN	Fort Worth	DFW	West	6					Shermanor Fort Worth	12	Denton	8	Denton
	31	Ellis	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	ELL	Fort Worth	DFW	West	5					Fort Worth	12	Fort Worth, Dallas or Corsicana	8	Ellis
	23	Hood	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	HOD	Fort Worth	DFW	West	5					Fort Worth	12	Mineral Wells or Fort Worth	8	Hood
	24	Hunt	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	HNT	Fort Worth	DFW	West	6					Shermanor Fort Worth	12	Greenville	10	Hunt
	36	Johnson	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	JOH	Fort Worth	DFW	West	5					Fort Worth	12	Mineral Wells or Fort Worth	8	Johnson
	10	Kaufman	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	KAU	Fort Worth	DFW	West	6					Fort Worth	12	Greenville, **Dallas** or Corsicana	8	Kaufman
	39	Parker	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	PAR	Fort Worth	DFW	West	6					Fort Worth	12	Mineral Wells or Fort Worth	8	Parker
	13	Rockwall	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	ROC	Fort Worth	DFW	West	6					Shermanor Fort Worth	12	**Dallas** or Greeenville	8	Rockwall
	17	Tarrant	03927	Dallas - Fort Worth International Airpor (DFW)	NREL	Overton	03927	Fort Worth	Fort Worth	78	Fort Worth	83	TAR	Fort Worth	DFW	West	5	2354		6174		Fort worth	12	Fort worth	8	Tarrant
Houston/Galveston	2	Brazoria	12960	Houston Bush Intercontinental (IAH)	NREL	Clear Lake	12960	Houston	Houston	96	Houston	102	BRA	Houston	IAH	East	3					Houston	10	Houston, Galveston or Bay City	5	Brazoria
	5	Fort Bend	12960	Houston Bush Intercontinental (IAH)	NREL	Clear Lake	12960	Houston	Houston	96	Houston	102	FOB	Houston	IAH	East	4					Houston	10	Houston or Bay City	5	Fort Bend
	32	Galveston	12960	Houston Bush Intercontinental (IAH)	NREL	Clear Lake	12960	Houston	Houston	96	Houston	102	GAL	Houston	IAH	East	3		1263		7378	Houston	10	Galveston	5	Galveston
	34	Harris	12960	Houston Bush Intercontinental (IAH)	NREL	Clear Lake	12960	Houston	Houston	96	Houston	102	HAR	Houston	IAH	East	4	1346	1371	7125	7357	Houston	10	Houston	5	Harris
	37	Montgomery	12960	Houston Bush Intercontinental (IAH)	NREL	Clear Lake	12960	Houston	Houston	96	Houston	102	MOG	Houston	IAH	East	4					Houston	10	Huntsville or **Houston**	5	Montgomery
	20	Waller	12960	Houston Bush Intercontinental (IAH)	NREL	Clear Lake	12960	Houston	Houston	96	Houston	102	WAL	Houston	IAH	East	4					Houston	10	Houston	5	Waller
Tyler/Longview	33	Gregg	03901	Longview E Tx Rgnl Airport (GGG)	NREL	Overton	93987	Lufkin	Lufkin	125	Lufkin	131	GRE	Lufkin	GGG	East	6					Lufkin	12	Longview	8	Gregg
	35	Harrison	03901	Longview E Tx Rgnl Airport (GGG)	NREL	Overton	93987	Lufkin	Lufkin	125	Lufkin	131	HAN	Lufkin	GGG	East	6					Lufkin	12	Longview	8	Harrison
	9	Henderson	03901	Longview E Tx Rgnl Airport (GGG)	NREL	Overton	93987	Lufkin	Lufkin	125	Lufkin	131	HDS	Lufkin	GGG	East	5					Lufkin, Waco or Fort Worth	12	Tyler, Palestine or Corsicana	8	Henderson
	14	Rusk	03901	Longview E Tx Rgnl Airport (GGG)	NREL	Overton	93987	Lufkin	Lufkin	125	Lufkin	131	RUS	Lufkin	GGG	East	5					Lufkin	12	Tyler or Longview	8	Rusk
	16	Smith	03901	Longview E Tx Rgnl Airport (GGG)	NREL	Overton	93987	Lufkin	Lufkin	125	Lufkin	131	SMI	Lufkin	GGG	East	5		1296		6562	Lufkin	12	Tyler	8	Smith
	18	Upshur	03901	Longview E Tx Rgnl Airport (GGG)	NREL	Overton	93987	Lufkin	Lufkin	125	Lufkin	131	UPS	Lufkin	GGG	East	6					Lufkin	12	Tyler or Longview	8	Upshur
Beaumont Pt. Arthur	3	Chambers	12917	Port Arthur Se Tx Rgnl Airport (BPT)	TCEQ	C34-Galveston Airport	12917	Port Arthur	Port Arthur	166	Port Arthur	172	CHA	Port Arthur	BPT	East	4					Houston or Port Arthur	10	Beaumont or **Houston**	5	Chambers
	7	Hardin	12917	Port Arthur Se Tx Rgnl Airport (BPT)	TCEQ	C34-Galveston Airport	12917	Port Arthur	Port Arthur	166	Port Arthur	172	HAD	Port Arthur	BPT	East	4					Port Arthur	10	Beaumont	6	Hardin
	25	Jefferson	12917	Port Arthur Se Tx Rgnl Airport (BPT)	TCEQ	C34-Galveston Airport	12917	Port Arthur	Port Arthur	166	Port Arthur	172	JEF	Port Arthur	BPT	East	4	1416	1677	6888	6703	Port Arthur	10	Beaumont	6	Jefferson
	11	Liberty	12917	Port Arthur Se Tx Rgnl Airport (BPT)	TCEQ	C34-Galveston Airport	12917	Port Arthur	Port Arthur	166	Port Arthur	172	LIB	Port Arthur	BPT	East	4					Houston or Port Arthur	10	Beaumont, Galveston or **Houston**	5	Liberty
	12	Orange	12917	Port Arthur Se Tx Rgnl Airport (BPT)	TCEQ	C34-Galveston Airport	12917	Port Arthur	Port Arthur	166	Port Arthur	172	ORA	Port Arthur	BPT	East	4					Port Arthur	10	Beaumont	6	Orange
San Antonio	1	Bexar	12921	San Antonio International Airport (SAT)	TCEQ	C58-Camp Bullis	12921	San Antonio	San Antonio	187	San Antonio	194	BEX	San Antonio	SAT	West	4	1579	1644	7170	7142	San Antonio	12	San Antonio	6	Bexar
	28	Comal	12921	San Antonio International Airport (SAT)	TCEQ	C58-Camp Bullis	12921	San Antonio	San Antonio	187	San Antonio	194	COM	San Antonio	SAT	West	4					San Antonio	12	San Antonio	6	Comal
	6	Guadalupe	12921	San Antonio International Airport (SAT)	TCEQ	C58-Camp Bullis	12921	San Antonio	San Antonio	187	San Antonio	194	GUA	San Antonio	SAT	West	4					San Antonio	12	San Antonio	6	Guadalupe
	21	Wilson	12921	San Antonio International Airport (SAT)	TCEQ	C58-Camp Bullis	12921	San Antonio	San Antonio	187	San Antonio	194	WIL	San Antonio	SAT	West	4					San Antonio	12	San Antonio	6	Wilson
Victoria	19	Victoria	12912	Victoria Regional Airport (VCT)	TCEQ	C58-Camp Bullis	12912	Victoria	Victoria	347	Victoria	225	VIC	Victoria	VCT	East	3	Hou	1296	Hou	7507			Victoria	5	Victoria

Table 93: Availability of Weather Data for 41 Non-attainment and Affected County (NOAA, NREL, TCEQ, ESL).

County No.	County	Affected = A Non Attain = N Others = 0	WBAN No.	NOAA	Lat. Deg.	Lat. Min.	Long. Deg.	Long. Min.	Elev. (m)	Station No.	NREL	Lat. Deg.	Lat. Min.	Long. Deg.	Long. Min.	Elev. (m)	CAMS Ids	TCEQ	Lat. Deg.	Lat. Min.	Long. Deg.	Long. Min.	Elev. (m)	Site No.	ESL	Lat. Deg.	Lat. Min.	Long. Deg.	Long. Min.	Elev. (m)
1	Bastrop	A																												
2	Bexar	A	12921	San Antonio International Airport (SAT)	N 29	32	W 98	28	246.3								C58	Camp Bullis	N 29	38	W 98	34		140	UTHSC					
2	Bexar	A	12970	San Antonio Stinson Municipal Airport (SSF)	N 29	20	W 98	28	175.3																					
3	Caldwell	A																												
4	Comal	A																												
5	Ellis	A															C30	El Paso East	N 31	45	W 106	25								
5	Ellis	A															C94	Midlothian Tower	N 32	26	W 97	1								
6	Gregg	A	13901	Longview E Tx Rgnl Airport (GGG)	N 32	23	W 94	43	111.3																					
7	Guadalupe	A	12971	New Braunfels Municipal Airport (BAZ)	N 29	43	W 98	3	196.3																					
8	Harrison	A																												
9	Hays	A	-	SAN MARCOS : SAN MARCOS MUNICIPAL AIRPORT (HYI)	-	-	-	-	-																					
10	Johnson	A															C77	Cleburne Airport	N 32	21	W 97	26								
11	Kaufman	A	53911	Terrell Municipal Airport (TRL)	N 32	43	W 96	16	144.3								C71	Kaufman	N 32	34	W 96	19								
12	Nueces	A	12924	Corpus Christi International Airport (CRP)	N 27	46	W 97	31	12.5	6	Corpus Christi						C4	Corpus Christi West	N 27	46	W 97	26								
12	Nueces	A	-	CORPUS CHRISTI: CORPUS CHRISTI NAS/TRUAX FIELD ARPT (NGP)	-	-	-	-	-																					
13	Parker	A															C76	Parker County (Fort Worth)	N 32	52	W 97	54								
14	Rockwall	A															C69	Rockwall Heath	N 32	56	W 96	26								
15	Rusk	A									12	Overton																		
16	San Patricio	A																												
17	Smith	A	13972	Tyler Pounds Field (TYR)	N 32	21	W 95	24	165.3								C02	Tyler Airport relocated	N 32	21	W 95	25								
18	Travis	A	13904	Austin - Bergstrom Internationa (AUS)	N 30	11	W 97	41	146.3	2	Austin						C38	Austin Audubon Society	N 30	29	W 97	52		202	S.F. Austin Building (SFA)					
18	Travis	A	13958	Austin Camp Mabry (ATT)	N 30	19	W 97	46	200.3															217	Robert E. Johnson Elec.Rcom. (West Solar)					
18	Travis	A																						217	Robert E. Johnson Elec.Rcom. (South Solar)					
19	Upshur	A																												
20	Victoria	A	12912	Victoria Regional Airport (VCT)	N 28	52	W 96	56	35.1								C87	Victoria	N 28	50	W 97	0								
21	Williamson	A	-	GEORGETOWN : GEORGETOWN MUNICIPAL AIRPORT (GTU)	-	-	-	-	-																					
22	Wilson	A																												
23	Henderson	A																												
24	Hood	A															C73	Granbury	N 32	27	W 97	46								
25	Hunt	A															C1006	Greenville	N 33	9	W 96	7								
26	Brazoria	N	12976	Angleton / Lake Jackson Brazori (LBX)	N 29	7	W 95	28	76.0								C1016	Lake Jackson	N 29	3	W 95	26								
26	Brazoria	N	12975	Houston Clover Field (VJ)	N 29	31	W 95	15	13.4																					
27	Chambers	N																												
28	Collin	N	53914	McKinney Municipal Airport (TKI)	N 33	11	W 96	35	176.3								C31	Frisco C31	N 33	8	W 96	47								
28	Collin	N															C68	Anna	N 33	21	W 96	33								
29	Dallas	N	33005	Dallas Love Field (DAL)	N 32	51	W 96	51	134.1								C63	Dallas North #2 (Dallas)	N 32	55	W 96	46		794	Federal Reserve - Weather Station (FRW)					
29	Dallas	N	03971	Dallas Redbird Airport (RBD)	N 32	41	W 96	52	200.3								C74	Sunnyvale Long Creek (Dallas)	N 32	46	W 96	33								
29	Dallas	N															C401	Dallas Hinton St	N 32	49	W 96	52								
30	Denton	N	03991	Denton Municpal Airport (DTO)	N 33	12	W 97	12	195.7								C56	Denton Airport South	N 33	12	W 97	12								
31	El Paso	N	23044	El Paso International Airport (ELP)	N 31	49	W 106	23	1194.2	9	El Paso						C12	El Paso UTEP	N 31	46	W 106	30		325	Valle Verde Campus (ECV)					
31	El Paso	N															C37	Ascarate Park SE	N 31	45	W 106	24								
31	El Paso	N															C41	El Paso Chamizal	N 31	46	W 106	27								
32	Fort Bend	N	12977	Houston Sugarland Mem (SGR)	N 29	37	W 95	39	25.0																					
33	Galveston	N	12923	Galveston Scholes Field (GLS)	N 29	16	W 94	52	1.5								C34	Galveston Airport	N 29	16	W 94	51								
34	Hardin	N																												
35	Harris	N	12960	Houston Bush Intercontinental (IAH)	N 29	59	W 95	22	29.0	5	Clear Lake						C8	Aldine	N 29	54	W 95	20		121	UT Health Science Center					
35	Harris	N	53910	Houston Hooks Memorial Airport (DWH)	N 30	4	W 95	33	46.3								C15	Channelview	N 29	48	W 95	8		931	Habitat Humanity Houses					
35	Harris	N	12918	Houston William P Hobby Airport (HOU)	N 29	38	W 95	17	13.4								C26	Northwest Harris County	N 30	2	W 95	40								
35	Harris	N															C35	Deer Park #2	N 29	40	W 95	8								
35	Harris	N															C45	Seabrook Friendship Park	N 29	35	W 95	1								
35	Harris	N															C53	Houston Bayland Park	N 29	42	W 95	30								
35	Harris	N															C81	Houston Regional Office	N 29	44	W 95	19								
35	Harris	N															C85	Karnack	N 32	40	W 94	10								
35	Harris	N															C403	Clinton (TCEQ, Houston)	N 29	44	W 95	15								
35	Harris	N															C617	Wallisville Road	N 29	49	W 94	59								
35	Harris	N															C1015	Lynchburg Ferry	N 29	46	W 95	5								
36	Jefferson	N	12917	Port Arthur Se Tx Rgnl Airport (BPT)	N 29	57	W 94	1	4.9								C20	Port Arthur West	N 29	54	W 93	59								
36	Jefferson	N															C2	Beaumont Downtown	N 30	2	W 94	4								
36	Jefferson	N															C64	Hamshire	N 29	52	W 94	19								
36	Jefferson	N															C643	SETRPC 43 Jefferson County Airport	N 29	57	W 94	0	0							
37	Liberty	N																												
38	Montgomery	N	53902	Conroe Montgomery County Airport (CXO)	N 30	21	W 95	25	74.7								C78	Conroe Airport Relocated	N 30	21	W 95	25								
39	Orange	N															C9	West Orange	N 30	5	W 93	46								
40	Tarrant	N	53907	Arlington Municipal Airport (GKY)	N 32	40	W 97	6	192.3								C61	Arlington Municipal Airport	N 32	39	W 97	5		111	University Hall (UT Arlington)					
40	Tarrant	N	03927	Dallas - Fort Worth International Airpor (DFW)	N 32	54	W 97	1	170.7								C70	Grapevine Fairway	N 32	59	W 97	4								
40	Tarrant	N	53909	Fort Worth Alliance Airport (AFW)	N 32	58	W 97	19	208.3								C13	Fort Worth Northwest	N 32	48	W 97	21								
40	Tarrant	N	13961	Fort Worth Meacham (FTW)	N 32	49	W 97	22	209.4								C17	Keller (Fort Worth)	N 32	55	W 97	17								
40	Tarrant	N															C75	Eagle Mountain Lake (Fort Worth)	N 32	59	W 97	29								
41	Waller	N																												

County No.	County	WBAN No.	TMY2	Latitude Deg.	Latitude Min.	Longitude Deg.	Longitude Min.	Elev. (m)	NOAA 99	NOAA 00	NOAA 01	NOAA 02	NOAA 03	NREL 99	NREL 00	NREL 01	NREL 02	NREL 03	TCEQ 99	TCEQ 00	TCEQ 01	TCEQ 02	TCEQ 03	ESL 99	ESL 00	ESL 01	ESL 02	ESL 03
1	Bastrop	13958	Austin	N 30	18	W 97	42	189																				
2	Bexar	12921	San Antonio	N 29	32	W 98	28	242	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	Bexar	12922	San Antonio	N 29	32	W 98	28	242	Y	Y	Y	Y	Y															
3	Caldwell	13958	Austin	N 30	18	W 97	42	189																				
4	Comal	12923	San Antonio	N 29	32	W 98	28	242																				
5	Ellis	03936	Fort Worth	N 32	50	W 97	3	164											Y									
5	Ellis	03937	Fort Worth	N 32	50	W 97	3	164												Y	Y	Y	Y					
6	Gregg	93987	Lufkin	N 31	14	W 94	45	96	Y	Y	Y	Y	Y															
7	Guadalupe	12924	San Antonio	N 29	32	W 98	28	242	Y	Y	Y	Y	Y															
8	Harrison	93988	Lufkin	N 31	14	W 94	45	96																				
9	Hays	93989	Lufkin	N 31	14	W 94	45	96				Y	Y															
10	Johnson	03930	Fort Worth	N 32	50	W 97	3	164														Y	Y					
11	Kaufman	03939	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y							Y	Y	Y	Y					
12	Nueces	12924	Corpus Christi	N 27	46	W 97	30	13	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y					
12	Nueces	12924	Corpus Christi	N 27	46	W 97	30	13	Y	Y	Y	Y	Y															
13	Parker	03940	Fort Worth	N 32	50	W 97	3	164														Y	Y					
14	Rockwall	03941	Fort Worth	N 32	50	W 97	3	164														Y	Y					
15	Rusk	93987	Lufkin	N 31	14	W 94	45	96						Y	Y	Y	Y	Y										
16	San Patricio	12924	Corpus Christi	N 27	46	W 97	30	13																				
17	Smith	93900	Lufkin	N 31	14	W 94	45	96	Y	Y	Y	Y	Y									Y	Y					
18	Travis	93990	Lufkin	N 31	14	W 94	45	96	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
18	Travis	93991	Lufkin	N 31	14	W 94	45	96	Y	Y	Y	Y	Y													Y	Y	Y
18	Travis	93992	Lufkin	N 31	14	W 94	45	96																		Y	Y	Y
19	Upshur	93989	Lufkin	N 31	14	W 94	45	96																				
20	Victoria	12912	Victoria	N 28	51	W 96	55	32	Y	Y	Y	Y	Y									Y	Y					
21	Williamson	93993	Lufkin	N 31	14	W 94	45	96				Y	Y															
22	Wilson	12925	San Antonio	N 29	32	W 98	28	242																				
23	Henderson																											
24	Hood																					Y	Y					
25	Hunt																						Y					
26	Brazoria	12960	Houston	N 29	59	W 95	22	33	Y	Y	Y	Y	Y										Y					
26	Brazoria	12960	Houston	N 29	59	W 95	22	33	Y	Y	Y	Y	Y															
27	Chambers	12917	Port Arthur	N 29	57	W 94	1	7																				
28	Collin	03937	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y									Y	Y					
28	Collin	03938	Fort Worth	N 32	50	W 97	3	164														Y	Y					
29	Dallas	03927	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y									Y	Y				Y	Y
29	Dallas	03928	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y									Y	Y					
29	Dallas	03929	Fort Worth	N 32	50	W 97	3	164											Y	Y	Y	Y	Y					
30	Denton	03942	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y							Y	Y	Y	Y					
31	El Paso	23044	El Paso	N 31	48	W 106	24	1194	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
31	El Paso	23045	El Paso	N 31	48	W 106	24	1194												Y	Y	Y	Y					
31	El Paso	23046	El Paso	N 31	48	W 106	24	1194											Y	Y	Y	Y	Y					
32	Fort Bend	12969	Houston	N 29	59	W 95	22	33		Y	Y	Y	Y															
33	Galveston	12960	Houston	N 29	59	W 95	22	33	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y					
34	Hardin	12918	Port Arthur	N 29	57	W 94	1	7																				
35	Harris	12960	Houston	N 29	59	W 95	22	33	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
35	Harris	12960	Houston	N 29	59	W 95	22	33	Y	Y	Y	Y	Y									Y	Y	Y	Y	Y	Y	Y
35	Harris	12960	Houston	N 29	59	W 95	22	33	Y	Y	Y	Y	Y						Y	Y	Y	Y	Y					
35	Harris	12961	Houston	N 29	59	W 95	22	33											Y	Y	Y	Y	Y					
35	Harris	12962	Houston	N 29	59	W 95	22	33														Y	Y					
35	Harris	12963	Houston	N 29	59	W 95	22	33											Y	Y	Y	Y	Y					
35	Harris	12964	Houston	N 29	59	W 95	22	33														Y	Y					
35	Harris	12965	Houston	N 29	59	W 95	22	33														Y	Y					
35	Harris	12966	Houston	N 29	59	W 95	22	33											Y	Y	Y	Y	Y					
35	Harris	12967	Houston	N 29	59	W 95	22	33											-	-	-	-	-					
35	Harris	12968	Houston	N 29	59	W 95	22	33															Y					
36	Jefferson	12919	Port Arthur	N 29	57	W 94	1	7	Y	Y	Y	Y	Y									Y	Y					
36	Jefferson	12920	Port Arthur	N 29	57	W 94	1	7														Y	Y					
36	Jefferson	12921	Port Arthur	N 29	57	W 94	1	7														Y	Y					
36	Jefferson	12922	Port Arthur	N 29	57	W 94	1	7											Y	Y	Y	Y	Y					
37	Liberty	12923	Port Arthur	N 29	57	W 94	1	7																				
38	Montgomery	12970	Houston	N 29	59	W 95	22	33	Y	Y	Y	Y	Y									Y	Y					
39	Orange	12924	Port Arthur	N 29	57	W 94	1	7														Y	Y					
40	Tarrant	03931	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y									Y	Y	Y	Y	Y	Y	Y
40	Tarrant	03932	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y							Y	Y	Y	Y					
40	Tarrant	03933	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y							Y	Y	Y	Y					
40	Tarrant	03934	Fort Worth	N 32	50	W 97	3	164	Y	Y	Y	Y	Y									Y	Y					
40	Tarrant	03935	Fort Worth	N 32	50	W 97	3	164														Y	Y					
41	Waller	12971	Houston	N 29	59	W 95	22	33																				

Note:

	County No.	The affected and non attainment county numbers are listed orderly using table 19, p. 131, of the TERP Technical Report 2003.
		The other county numbers are listed alphabetically.
NOAA	**WBAN No.**	Station's Weather Bureau Army Navy number
TMY2	**WBAN No.**	Station's Weather Bureau Army Navy number
NREL	**Station No.**	The station numbers are listed alphabetically.
TECQ	**CAMS Ids**	The numbers are from TECQ.
ESL	**Site No.**	ESL's site numbers.
	Y in black:	The whole years data is available
	Y in red:	The data is available for partial year

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Table 94: Main NOAA Weather Stations used in eCALC.

ABI	Abilene Regional Airport
AMA	Amarillo International Airport
BRO	Brownsville S. Padre Island International
LBB	Lubbock International Airport
MAF	Midland International Airport
SJT	San Angelo Mathis Field
ACT	Waco Regional Airport
SPS	Wichita Falls Municipal Airport
ATT	Austin Camp Mabry
BPT	Port Arthur Se TX Rgnl Airport
CRP	Corpus Christi International Airport
DFW	Dallas - Fort Worth International Airport
ELP	El Paso International Airport
GGG	Longview E TX Rgnl Airport
IAH	Houston Bush Intercontinental
SAT	San Antonio International Airport
VCT	Victoria Regional Airport

Table 95: Summary of Weather Data Assignments for ERCOT Counties.

ERCOT COUNTY	ASSIGNED WEATHER STATION	ERCOT COUNTY	ASSIGNED WEATHER STATION	ERCOT COUNTY	ASSIGNED WEATHER STATION
ANDERSON	GGG	FRANKLIN	DFW	MIDLAND	MAF
ANDREWS	MAF	FREESTONE	ACT	MILAM	IAH
ANGELINA	GGG	FRIO	SAT	MILLS	ACT
ARANSAS	CRP	GALVESTON	IAH	MITCHELL	ABI
ARCHER	SPS	GILLESPIE	ATT	MONTAGUE	SPS
ATASCOSA	SAT	GLASSCOCK	MAF	MONTGOMERY	IAH
AUSTIN	IAH	GOLIAD	VCT	MOTLEY	LBB
BANDERA	SAT	GONZALES	SAT	NACOGDOCHES	GGG
BASTROP	ATT	GRAYSON	SPS	NAVARRO	ACT
BAYLOR	SPS	GRIMES	IAH	NOLAN	ABI
BEE	VCT	GUADALUPE	SAT	NUECES	CRP
BELL	ACT	HALL	AMA	PALO PINTO	ABI
BEXAR	SAT	HAMILTON	ACT	PARKER	DFW
BLANCO	ATT	HARDEMAN	SPS	PECOS	SJT
BORDEN	LBB	HARRIS	IAH	PRESIDIO	SJT
BOSQUE	ACT	HASKELL	ABI	RAINS	DFW
BRAZORIA	IAH	HAYS	ATT	REAGAN	MAF
BRAZOS	IAH	HENDERSON	DFW	REAL	ATT
BREWSTER	SJT	HIDALGO	BRO	RED RIVER	DFW
BRISCOE	AMA	HILL	ACT	REEVES	MAF
BROOKS	BRO	HOOD	DFW	REFUGIO	VCT
BROWN	ACT	HOPKINS	DFW	ROBERTSON	IAH
BURLESON	IAH	HOUSTON	GGG	ROCKWALL	DFW
BURNET	ATT	HOWARD	MAF	RUNNELS	SJT
CALDWELL	ATT	HUDSPETH	ELP	RUSK	GGG
CALHOUN	VCT	HUNT	SPS	SAN PATRICIO	CRP
CALLAHAN	ABI	IRION	SJT	SAN SABA	ATT
CAMERON	BRO	JACK	ABI	SCHLEICHER	SJT
CHAMBERS	BPT	JACKSON	VCT	SCURRY	LBB
CHEROKEE	GGG	JEFF DAVIS	MAF	SHACKELFORD	ABI
CHILDRESS	LBB	JIM HOGG	BRO	SMITH	DFW
CLAY	SPS	JIM WELLS	CRP	SOMERVELL	DFW
COKE	SJT	JOHNSON	DFW	STARR	BRO
COLEMAN	ABI	JONES	ABI	STEPHENS	ABI
COLLIN	DFW	KARNES	VCT	STERLING	SJT
COLORADO	IAH	KAUFMAN	DFW	STONEWALL	LBB
COMAL	SAT	KENDALL	SAT	SUTTON	SJT
COMANCHE	ACT	KENEDY	BRO	TARRANT	DFW
CONCHO	SJT	KENT	LBB	TAYLOR	ABI
COOKE	SPS	KERR	ATT	TERRELL	SJT
CORYELL	ACT	KIMBLE	SJT	THROCKMORTON	ABI
COTTLE	SPS	KING	LBB	TITUS	DFW
CRANE	MAF	KINNEY	SAT	TOM GREEN	SJT
CROCKETT	SJT	KLEBERG	CRP	TRAVIS	ATT
CROSBY	LBB	KNOX	SPS	UPTON	MAF
CULBERSON	ELP	LA SALLE	CRP	UVALDE	SAT
DALLAS	DFW	LAMAR	DFW	VAL VERDE	SAT
DAWSON	LBB	LAMPASAS	ACT	VAN ZANDT	DFW
DE WITT	VCT	LAVACA	VCT	VICTORIA	VCT
DELTA	DFW	LEE	ATT	WALLER	IAH
DENTON	DFW	LEON	ACT	WARD	MAF
DICKENS	LBB	LIMESTONE	ACT	WASHINGTON	IAH
DIMMIT	CRP	LIVE OAK	CRP	WEBB	CRP
DUVAL	CRP	LLANO	ATT	WHARTON	VCT
EASTLAND	ABI	LOVING	MAF	WICHITA	SPS
ECTOR	MAF	MADISON	IAH	WILBARGER	SPS
EDWARDS	SJT	MARTIN	MAF	WILLACY	BRO
ELLIS	DFW	MASON	ATT	WILLIAMSON	ATT
ERATH	ABI	MATAGORDA	VCT	WILSON	SAT
FALLS	ACT	MAVERICK	CRP	WINKLER	MAF
FANNIN	SPS	MCCULLOCH	SJT	WISE	DFW
FAYETTE	IAH	MCLENNAN	ACT	YOUNG	ABI
FISHER	ABI	MCMULLEN	CRP	ZAPATA	BRO
FOARD	SPS	MEDINA	SAT	ZAVALA	CRP
FORT BEND	IAH	MENARD	SJT		

Table 96: Assignment of NWS Weather Stations for all ERCOT Counties.

No.	The City TMY2 Weather File is Available	County with TMY2 Weather Station					Adjacent Counties						Nearest Counties						
		County Name	Weather Zone	HDD	Table	Weather Station Assigned	No.	County Name	Weather Zone	HDD	Table	Weather Station Assigned	No.	County Name	Nearest Cities with TMY2 Files	Weather Zone	HDD	Table	Weather Station Assigned
1	Abilene	TAYLOR	6B	2584	B-8	ABI	1	CALLAHAN	6B			ABI	1	EASTLAND	Abilene (6B)	6B			ABI
							2	COLEMAN	5B			ABI	2	ERATH	Abilene (6B), Fort Worth (5B)	6B			ABI
							3	FISHER	6B			ABI	3	HASKELL	Abilene (6B), Wichita Falls (7B)	6B			ABI
							4	JONES	6B			ABI	4	JACK	Fort Worth (5B), Abilene (6B)	6B			ABI
							5	NOLAN	6B			ABI	5	MITCHELL	Abilene (6B), Midland (6B)	6B			ABI
							6	SHACKELFORD	6B			ABI	6	PALO PINTO	Fort Worth (5B), Abilene (6B)	6B	2625	B-8	ABI
													7	STEPHENS	Abilene (6B)	6B			ABI
													8	THROCKMORTON	Abilene (6B), Wichita Falls (7B)	6B			ABI
													9	YOUNG	Wichita Falls (7B), Abilene (6B), Fort Worth (5B)	6B			ABI
2	Amarillo	POTTER	9B	4258	B-13	AMA							10	BRISCOE	Amarillo (9B), Lubbock (7B)	8			AMA
													11	HALL	Amarillo (9B), Lubbock (7B)	8			AMA
3	Austin	TRAVIS	5B	1688	B-6	ATT	7	BASTROP	4B			ATT	12	GILLESPIE	San Antonio (4B), Austin (5B)	5A			ATT
							8	BLANCO	5A			ATT	13	KERR	San Antonio (4B), Austin (5B)	5A			ATT
							9	BURNET	5A			ATT	14	LEE	Austin (5B), Houston (4B)	4B			ATT
							10	CALDWELL	4B			ATT	15	LLANO	Austin (5B), San Antonio (4B),	5B			ATT
							11	HAYS	5B			ATT	16	MASON	Austin (5B), San Antonio (4B),	5B			ATT
							12	WILLIAMSON	5B			ATT	17	REAL	San Antonio (4B), Austin (5B), San Angelo (5B)	5A			ATT
													18	SAN SABA	Austin (5B), San Angelo (5B), Waco (5B)	5B			ATT
4	Brownsville	CAMERON	2B	635	B-3	BRO	13	HIDALGO	2B	778	B-3	BRO	19	BROOKS	Brownsville (2B), Corpus Christie (3B)	2B			BRO
							14	WILLACY	2B			BRO	20	JIM HOGG	Brownsville (2B), Corpus Christie (3B)	2B			BRO
													21	KENEDY	Brownsville (2B), Corpus Christie (3B)	2B			BRO
													22	STARR	Brownsville (2B)	2B			BRO
													23	ZAPATA	Brownsville (2B), Corpus Christie (3B)	2B			BRO
5	Corpus Christi	NUECES	3B	1016	B-5	CRP	15	ARANSAS	3B			CRP	24	DIMMIT	Corpus Christi (3B), San Anotonio (4B)	3C			CRP
							16	JIM WELLS	3C	1062	B-5	CRP	25	DUVAL	Corpus Christi (3B)	3C			CRP
							17	KLEBERG	2B			CRP	26	LA SALLE	Corpus Christi (3B)	3C			CRP
							18	SAN PATRICIO	3C			CRP	27	LIVE OAK	Corpus Christi (3B), Victoria (3B)	3C			CRP
													28	MAVERICK	San Anotonio (4B), Corpus Christi (3B)	3C	1441	B-5	CRP
													29	MCMULLEN	Corpus Christi (3B), Victoria (3B)	3C			CRP
													30	WEBB	Corpus Christi (3B)	3C	1025	B-5	CRP
													31	ZAVALA	San Anotonio (4B), Corpus Christi (3B)	3C			CRP
6	El Paso	EL PASO	6B	2708	B-10	ELP	19	HUDSPETH	6B			ELP	32	CULBERSON	El Paso (6B)	6B			ELP
7	Fort Worth	TARRANT	5B	2304	B-8	DFW	20	COLLIN	6B			DFW	33	DELTA	Fort Worth (5B)	6B			DFW
							21	DALLAS	5B	2259	B-8	DFW	34	FRANKLIN	Fort Worth (5B)	6B			DFW
							22	DENTON	6B	2665	B-8	DFW	35	HENDERSON	Fort Worth (5B), Lufkin (5A), Waco (5B)	5B			DFW
							23	ELLIS	5B			DFW	36	HOOD	Fort Worth (5B), Waco (5B)	5B			DFW
							24	JOHNSON	5B			DFW	37	HOPKINS	Fort Worth (5B)	6B			DFW
							25	PARKER	6B			DFW	38	KAUFMAN	Fort Worth (5B)	6B			DFW
							26	WISE	6B			DFW	39	LAMAR	Fort Worth (5B)	6B			DFW
													40	RAINS	Fort Worth (5B)	6B			DFW
													41	RED RIVER	Fort Worth (5B)	6B			DFW
													42	ROCKWALL	Fort Worth (5B)	6B			DFW
													43	SMITH	Fort Worth (5B), Lufkin (5A)	5B	2194	B-8	DFW
													44	SOMERVELL	Fort Worth (5B), Waco (5B)	5B			DFW
													45	TITUS	Fort Worth (5B)	6B			DFW
													46	VAN ZANDT	Fort Worth (5B)	6B			DFW
8	Houston	HARRIS	4B	1371	B-5	IAH	27	BRAZORIA	3B			IAH	47	AUSTIN	Houston (4B)	4B			IAH
							28	FORT BEND	4B			IAH	48	BRAZOS	Houston (4B), Austin (5B), Waco (5B)	4B			IAH
							29	GALVESTON	3B	1263	B-5	IAH	49	BURLESON	Austin (5B), Waco (5B), Houston (4B)	4B			IAH
							30	MONTGOMERY	4B			IAH	50	COLORADO	Houston (4B), Victoria (3B)	4B			IAH
							31	WALLER	4B			IAH	51	FAYETTE	Houston (4B), San Antonio (4B)	4B			IAH
													52	GRIMES	Houston (4B)	4B			IAH
													53	MADISON	Houston (4B), Waco (5B), Lufkin (5A)	4B			IAH
													54	MILAM	Austin (5B), Waco (5B), Houston (4B)	4B			IAH
													55	ROBERTSON	Waco (5B), Houston (4B)	4B			IAH
													56	WASHINGTON	Houston (4B), Austin (5B)	4B			IAH
9	Lubbock	LUBBOCK	7B	3431	B-11	LBB	32	CROSBY	7B			LBB	57	BORDEN	Lubbock (7B), Abilene (6B), Midland (6B)	7B			LBB
													58	CHILDRESS	Lubbock (7B), Wichita Falls (7B)	7B			LBB
													59	DAWSON	Lubbock (7B), Midland (6B)	7B	3159	B-11	LBB
													60	DICKENS	Lubbock (7B)	7B			LBB
													61	KENT	Lubbock (7B), Abilene (6B)	7B			LBB
													62	KING	Lubbock (7B), Abilene (6B), Wichita Falls (7B)	7B			LBB
													63	MOTLEY	Lubbock (7B)	7B			LBB
													64	SCURRY	Lubbock (7B), Midland (6B), Abilene (6B)	7B	3185	B-11	LBB
													65	STONEWALL	Abilene (6B), Lubbock (7B), Wichita Falls (7B)	7B			LBB
10	Lufkin	ANGELINA	5A	1951	B-8	GGG	33	CHEROKEE	5A			GGG	66	ANDERSON	Lufkin (5A)	5A	2005	B-8	GGG
							34	HOUSTON	5A			GGG	67	RUSK	Lufkin (5A)	5B			GGG
							35	NACOGDOCHES	5A			GGG	67						
11	Midland	MIDLAND	6B	2751	B-10	MAF	36	ANDREWS	6B			MAF	68	HOWARD	Midland (6B)	6B	2772	B-10	MAF
							37	CRANE	5B			MAF	69	JEFF DAVIS	Midland (6B), El Paso (6B)	6B			MAF
							38	ECTOR	6B			MAF	70	LOVING	Midland (6B)	6B			MAF
							39	GLASSCOCK	6B			MAF	71	REEVES	Midland (6B)	6B	2505	B-8	MAF
							40	MARTIN	6B			MAF	72	WARD	Midland (6B)	6B			MAF
							41	REAGAN	5B			MAF	73	WINKLER	Midland (6B)	6B			MAF
							42	UPTON	5B			MAF	73						
12	Port Arthur	JEFFERSON	4B	1677	B-6	BPT	43	CHAMBERS	4B			BPT	73						
13	San Angelo	TOM GREEN	5B	2414	B-8	SJT	44	COKE	6B			SJT	74	BREWSTER	El Paso (6B), San Angelo (5B)	5A			SJT
							45	CONCHO	5B			SJT	75	CROCKETT	San Angelo (5B)	5B			SJT
							46	IRION	5B			SJT	76	EDWARDS	San Angelo (5B)	5A			SJT
							47	MENARD	5B			SJT	77	KIMBLE	San Angelo (5B), Austin (5B)	5A			SJT
							48	RUNNELS	5B			SJT	78	MCCULLOCH	San Angelo (5B)	5B			SJT
							49	SCHLEICHER	5B			SJT	79	PECOS	San Angelo (5B)	5A			SJT
							50	STERLING	6B			SJT	80	PRESIDIO	El Paso (6B), San Angelo (5B)	5A			SJT
													81	SUTTON	San Angelo (5B)	5A			SJT
													82	TERRELL	San Angelo (5B)	5A			SJT
14	San Antonio	BEXAR	4B	1644	B-6	SAT	51	ATASCOSA	3C			SAT	83	FRIO	San Antonio (4B), Corpus Christi (3B)	3C			SAT
							52	BANDERA	5A			SAT	84	GONZALES	San Antonio (4B), Victoria (3B)	4B			SAT
							53	COMAL	4B			SAT	85	KINNEY	San Antonio (4B)	4B			SAT
							54	GUADALUPE	4B			SAT	86	UVALDE	San Antonio (4B)	4B			SAT
							55	KENDALL	5A			SAT	87	VAL VERDE	San Anotonio (4B), San Angelo (5B)	4B	1565	B-5	SAT
							56	MEDINA	4B			SAT	87						SAT
							57	WILSON	4B			SAT	87						
15	Victoria	VICTORIA	3B	1296	B-5	VCT	58	CALHOUN	3B			VCT	88	BEE	Corpus Christi (3B), Victoria (3B)	3B	1372	B-5	VCT
							59	DE WITT	3C			VCT	89	KARNES	Victoria (3B), San Antonio (4B), Corpus Christi (3B)	3C			VCT
							60	GOLIAD	3B			VCT	90	MATAGORDA	Victoria (3B)	3B	1370	B-5	VCT
							61	JACKSON	3B			VCT	91	WHARTON	Victoria (3B), Houston (4B)	3B			VCT
							62	LAVACA	4B			VCT	91						
							63	REFUGIO	3B			VCT	91						
16	Waco	MCLENNAN	5B	2179	B-8	ACT	64	BELL	5B	2127	B-8	ACT	92	BROWN	Abilene (6B), Waco (5B), San Angelo (5B)	5B	2199	B-8	ACT
							65	BOSQUE	5B			ACT	93	COMANCHE	Waco (5B), Abilene (6B)	5B			ACT
							66	CORYELL	5B			ACT	94	FREESTONE	Waco (5B)	5B			ACT
							67	FALLS	5B			ACT	95	HAMILTON	Waco (5B)	5B			ACT
							68	HILL	5B			ACT	96	LAMPASAS	Waco (5B), Austin (5B)	5B			ACT
							69	LIMESTONE	5B			ACT	97	LEON	Waco (5B), Lufkin (5A)	5B			ACT
													98	MILLS	Waco (5B), Austin (5B)	5B			ACT
													99	NAVARRO	Waco (5B), Fort Worth (5B)	5B	2396	B-8	ACT
17	Wichita Falls	WICHITA	7B	3042	B-10	SPS	70	ARCHER	7B			SPS	100	COOKE	Fort Worth (5B), Wichita Falls (7B)	6B			SPS
							71	BAYLOR	7B			SPS	101	COTTLE	Witchita Falls (7B), Lubbock (7B)	7B			SPS
							72	CLAY	7B			SPS	102	FANNIN	Fort Worth (5B), Wichita Falls (7B)	6B			SPS
							73	WILBARGER	7B	3186	B-10	SPS	103	FOARD	Witchita Falls (7B)	7B			SPS
													104	GRAYSON	Fort Worth (5B), Wichita Falls (7B)	6B	2890	B-10	SPS
													105	HARDEMAN	Witchita Falls (7B)	7B			SPS
													106	HUNT	Fort Worth (5B), Wichita Falls (7B)	6B	2953	B-10	SPS
													107	KNOX	Wichita Falls (7B)	7B			SPS
													108	MONTAGUE	Wichita Falls (7B), Fort Worth (5B)	6B			SPS

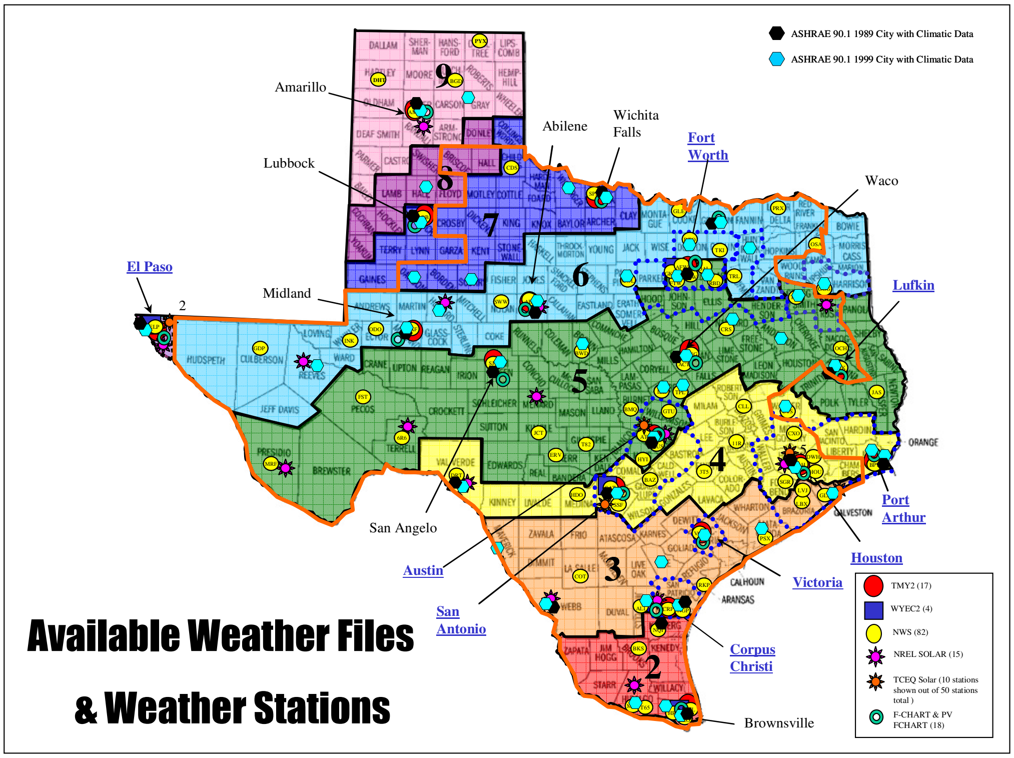


Figure 136: Available Weather Stations in Texas for all ERCOT Counties.

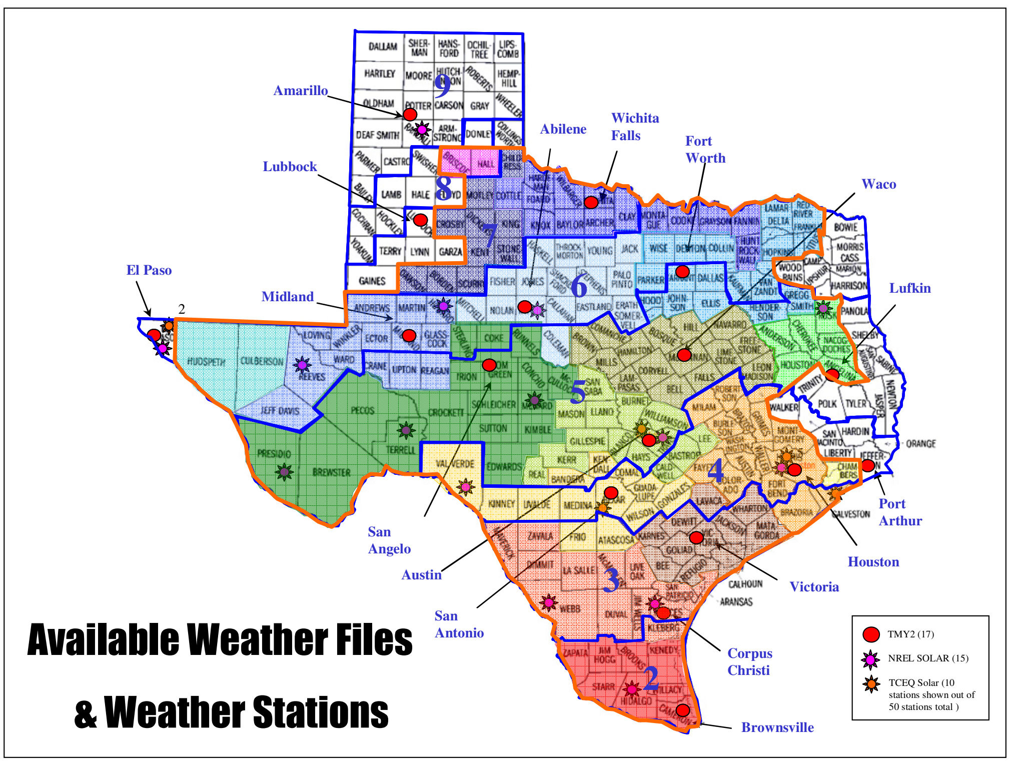


Figure 137: Grouping of Weather Stations in Texas for all ERCOT Counties.

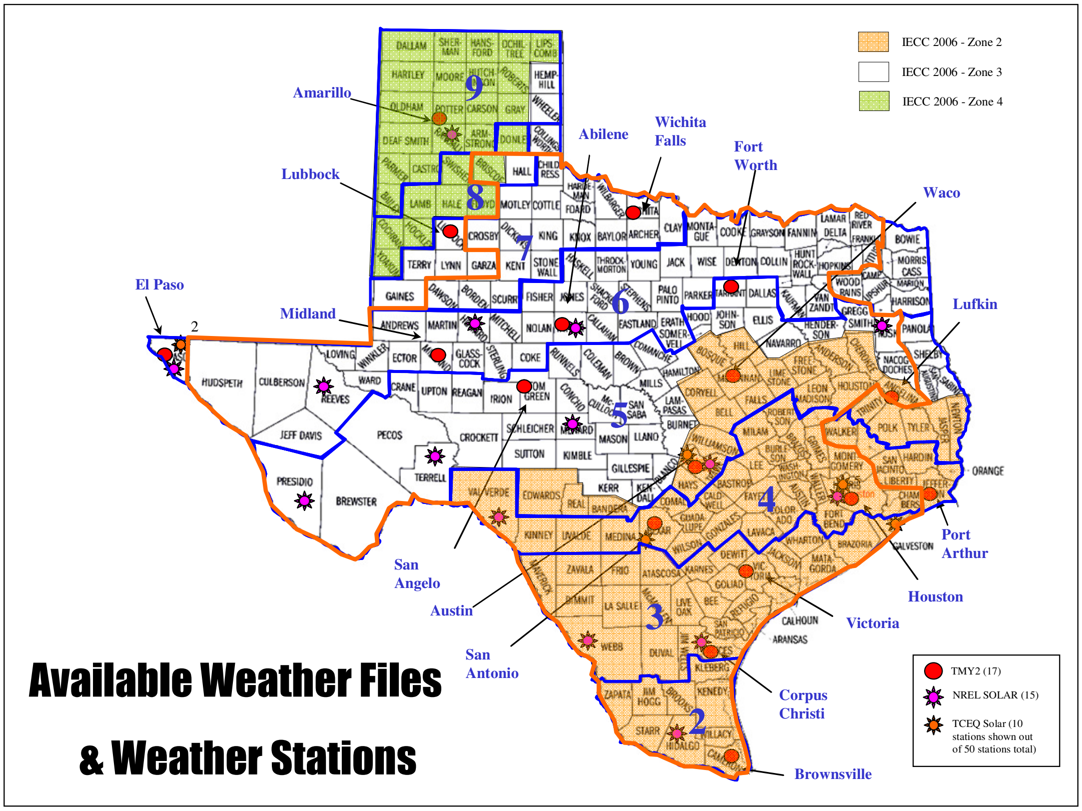


Figure 138: Available Weather Stations in Texas for all ERCOT Counties Showing 2000/2001 and 2006 Climate Zones.

Table 97: List of Available Weather Files in Texas (Listed by Symbol).

List of Available Weather Files and Weather Stations of Texas

Texas Weather Stations (NOAA)

1	Abilene Regional Airport (ABI)
2	Alice International Airport (ALI)
3	Amarillo International Airport (AMA)
4	Angleton / Lake Jackson Brazori (LBX)
5	Arlington Municipal Airport (GKY)
6	Austin - Bergstrom International (AUS)
7	Austin Camp Mabry (ATT)
8	Borger Hutchinson County Airport (BGD)
9	BRENHAM: BRENHAM MUNICIPAL AIRPORT (11R)
10	Brownsville S Padre Isl International (BRO)
11	BROWNWOOD: BROWNWOOD REGIONAL AIRPORT (BWD)
12	Burnet Municipal Airport (BMQ)
13	Childress Municipal Airport (CDS)
14	College Station (CLL)
15	Conroe Montgomery County Airport (CXO)
16	Corpus Christi International Airport (CRP)
17	CORPUS CHRISTI: CORPUS CHRISTI NAS/TRUAX FIELD ARPT (NGP)
18	Corsicana Campbell Field (CRS)
19	Cotulla La Salle Co Airport (COT)
20	Dalhart Municipal Airport (DHT)
21	Dallas - Fort Worth International Airport (DFW)
22	Dallas Love Field (DAL)
23	Dallas Redbird Airport (RBD)
24	Del Rio International Airport (DRT)
25	Denton Municipal Airport (DTO)
26	Dryden Terrell County Airport (6R6)
27	El Paso International Airport (ELP)
28	FALFURRIAS : BROOKS COUNTY AIRPORT (BKS)
29	Fort Stockton Pecos County Airport (FST)
30	Fort Worth Alliance Airport (AFW)
31	Fort Worth Meacham (FTW)
32	FREDERICKSBURG: GILLESPIE COUNTY AIRPORT (T82)
33	GAINESVILLE : GAINESVILLE MUNICIPAL AIRPORT (GLE)
34	Galveston Scholes Field (GLS)
35	GEORGETOWN : GEORGETOWN MUNICIPAL AIRPORT (GTU)
36	Harlingen Rio Grande Valley I (HRL)
37	Hondo Municipal Airport (HDO)
38	Houston Bush Intercontinental (IAH)
39	Houston Clover Field (LVJ)
40	Houston Hooks Memorial Airport (DWH)
41	Houston Sugarland Mem (SGR)
42	Houston William P Hobby Airport (HOU)
43	Huntsville Municipal Airport (UTS)
44	JASPER : JASPER COUNTY-BELL FIELD AIRPORT (JAS)
45	Junction Kimble County Airport (JCT)
46	KERRVILLE : KERRVILLE MUNI/LOUIS SCHREINER FLD AIRPORT (ERV)
47	KILLEEN : KILLEEN MUNICIPAL AIRPORT (ILE)
48	KINGSVILLE : KINGSVILLE NAS AIRPORT (NQI)
49	LA GRANGE : FAYETTE REGIONAL AIR CENTER AIRPORT (3T5)
50	Longview E Tx Rgnl Airport (GGG)
51	Lubbock International Airport (LBB)
52	Lufkin Angelina Cty Airport (LFK)
53	MARFA : MARFA MUNICIPAL AIRPORT (MRF)
54	McAllen Miller International Airport (MFE)
55	McKinney Municipal Airport (TKI)
56	Midland International Airport (MAF)
57	Mineral Wells Airport (MWL)
58	MOUNT PLEASANT : MOUNT PLEASANT REGIONAL AIRPORT (OSA)
59	NACOGDOCHES : A L MANGHAM JR REGIONAL AIRPORT (OCH)
60	New Braunfels Municipal Airport (BAZ)
61	Odessa Schlemeyer Field (ODO)
62	Palacios Municipal Airport (PSX)
63	PARIS : COX FIELD AIRPORT (PRX)
64	PERRYTON : PERRYTON OCHILTREE COUNTY AIRPORT (PYX)
65	Pine Springs Guadalupe Mounta (GDP)
66	Port Arthur Se Tx Rgnl Airport (BPT)
67	Port Isabel Cameron County Airport (PIL)
68	Rockport Aransas Co Airport (RKP)
69	San Angelo Mathis Field (SJT)
70	San Antonio International Airport (SAT)
71	San Antonio Stinson Municipal Airport (SSF)
72	SAN MARCOS : SAN MARCOS MUNICIPAL AIRPORT (HYI)
73	SWEETWATER : AVENGER FIELD AIRPORT (SWW)
74	TEMPLE: DRAUGHON-MILLER CNTRL TEXAS REGIONAL ARPT (TPL)
75	Terrell Municipal Airport (TRL)
76	Tyler Pounds Field (TYR)
77	Victoria Regional Airport (VCT)
78	WACO : MC GREGOR EXECUTIVE AIRPORT (PWG)
79	Waco Regional Airport (ACT)
80	WESLACO : MID VALLEY AIRPORT (T65)
81	Wichita Falls Municipal Airport (SPS)
82	Wink Winkler Co Airport (INK)

Texas TMY2 Weather Files

1	Abilene
2	Amarillo
3	Austin
4	Brownsville
5	Corpus Christi
6	El Paso
7	Fort Worth
8	Houston
9	Lubbock
10	Lufkin
11	Midland
12	Port Arthur
13	San Angelo
14	San Antonio
15	Victoria
16	Waco
17	Wichita Falls

Texas WYEC2 Weather Files

1	El Paso
2	Brownsville
3	Fort Worth
4	San Antonio

NREL Solar Stations

1	Abilene
2	Austin
3	Big Spring
4	Canyon
5	Clear Lake
6	Corpus Christi
7	Del Rio
8	Edinburg
9	El Paso
10	Laredo
11	Menard
12	Overton
13	Pecos
14	Presidio
15	Sanderson

TCEQ Solar Stations

1	Bexar
2	Travis
3	El Paso (2)
4	Galveston
5	Harris (5)

FCHART and PV FCHART (New Weather File)

1	ABILENE
2	AMARILLO
3	AUSTIN
4	BROWNSVILLE
5	CORPUS CHRISTI
6	EL PASO
7	FORT WORTH
8	HOUSTON
9	LUBBOCK
10	LUFKIN
11	MIDLAND-ODESSA
12	PORT ARTHUR
13	SAN ANGELO
14	SAN ANTONIO
15	SHERMAN
16	VICTORIA
17	WACO
18	WICHITA FALLS

9 PLANNED VERIFICATION TO THE EMISSIONS CALCULATOR (eCALC)

As part of the analysis effort, verification and validation efforts are planned for each of the major analysis areas in the emissions calculator, including: on-site inspections, and calibrated simulations.

9.1 On-site Inspections

On-site inspection work continued in 2007, including residential and commercial buildings to determine if specific energy-conserving features are being installed properly.

9.2 Calibrated Simulations

Calibrated simulations are planned for two commercial sites and one residential site to help confirm the accuracy of the code-compliant DOE-2 simulations. For each site, existing data loggers, installed from previous projects were restarted and the data from the sensors checked for accuracy. These sites include a standard office building, a K-12 school in College Station, Texas.

9.2.1 Standard Office building

The calibrated simulation of a standard office building using the Texas A&M University Systems Building in College Station, Texas, continues. Figure 139 to Figure 144 show the related information from this site. This building is currently being monitored as part of the campus energy conservation program and includes the channels shown in Figure 143. The goal with this site is to develop a calibrated simulation of the actual building (Figure 141), and a representative building (Figure 142), and then compare/contrast the savings differences between the calibrated model vs the representative model.

Figure 139: Standard Office Building (Texas A&M University Systems Building, College Station, Texas).

Figure 140: : Standard Office Building (Texas A&M University Systems Building, College Station, Texas).

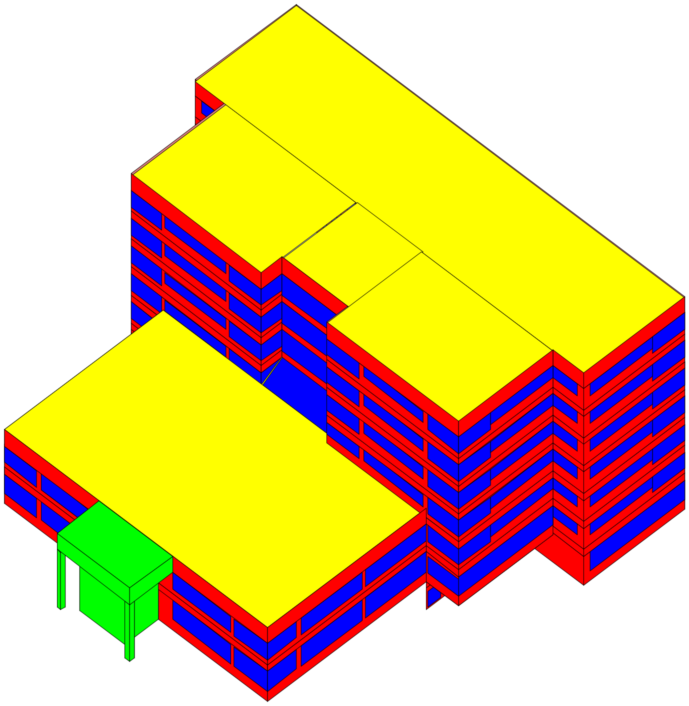


Figure 141: Computer Simulation (DOE-2.1E) of Case Study Office Building

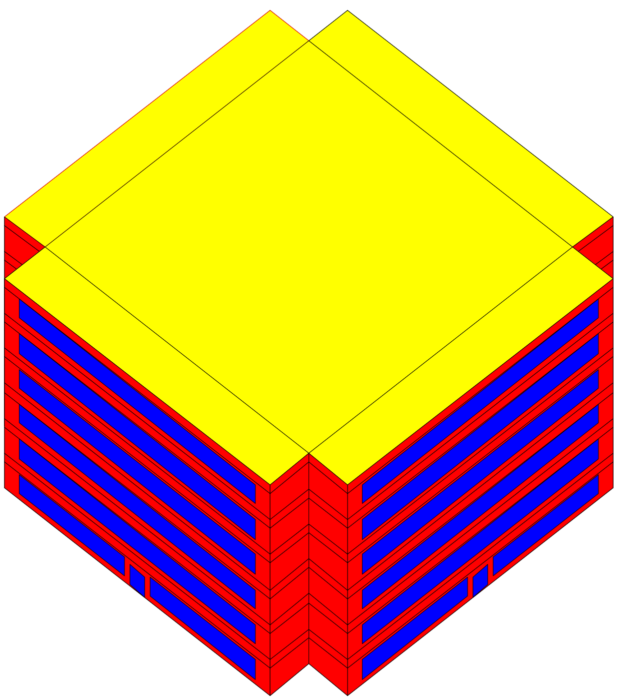


Figure 142: Computer Simulation (DOE-2.1E) of Base Case Office Building

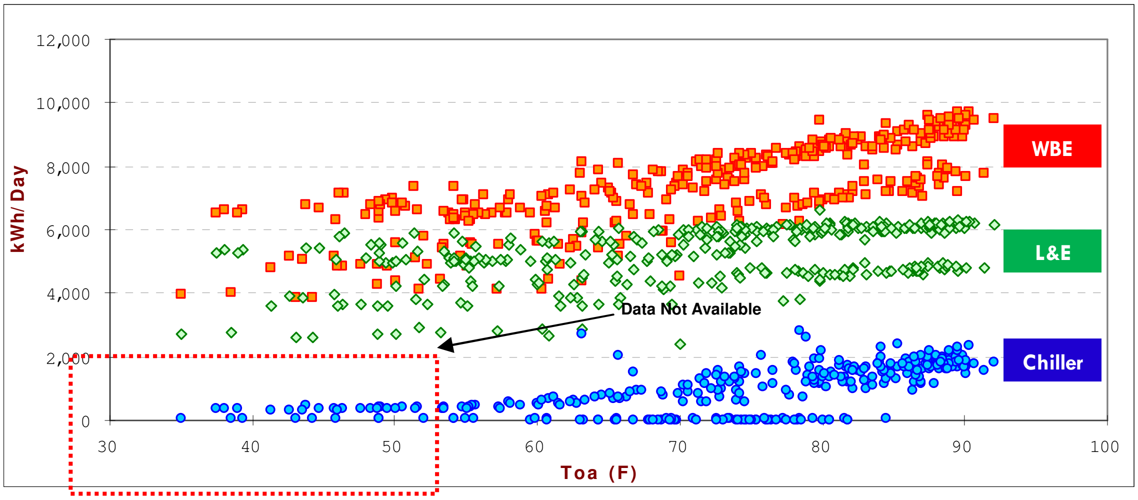
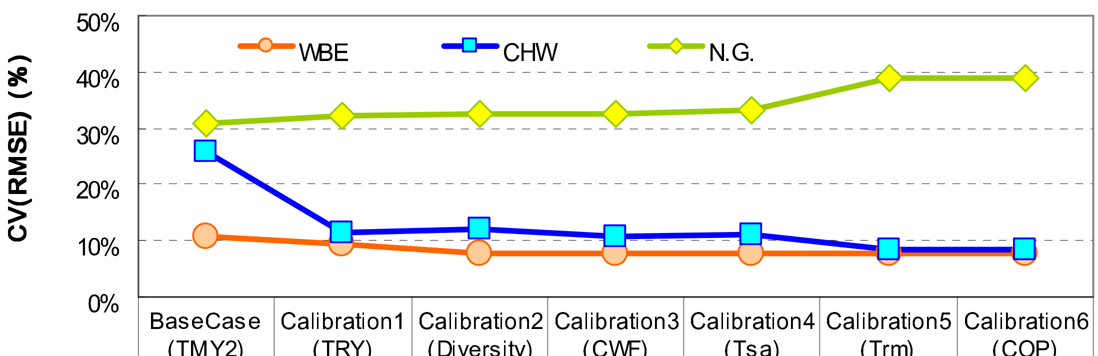
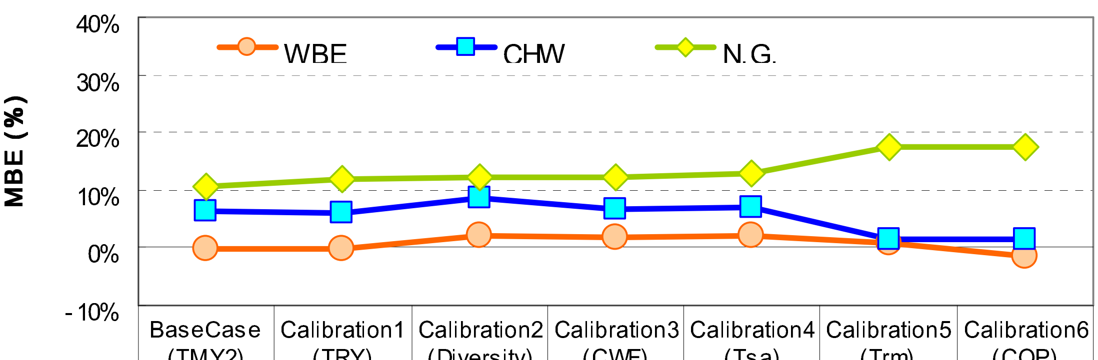


Figure 143: 2007 Scatter Plots from the Data logger Installed in the Case Study Office Building



	BaseCase (TMY2)	Calibration1 (TRY)	Calibration2 (Diversity)	Calibration3 (CWF)	Calibration4 (Tsa)	Calibration5 (Trm)	Calibration6 (COP)
WBE	10.6%	9.5%	7.8%	7.8%	7.9%	7.7%	7.7%
CHW	26.0%	11.3%	12.0%	10.9%	11.2%	8.5%	8.5%
N.G.	31.0%	32.1%	32.5%	32.5%	33.3%	39.0%	39.0%



	BaseCase (TMY2)	Calibration1 (TRY)	Calibration2 (Diversity)	Calibration3 (CWF)	Calibration4 (Tsa)	Calibration5 (Trm)	Calibration6 (COP)
WBE	-0.1%	-0.2%	2.1%	1.7%	1.9%	0.7%	-1.4%
CHW	6.4%	6.0%	8.6%	6.6%	7.1%	1.6%	1.6%
N.G.	10.6%	12.0%	12.2%	12.2%	12.9%	17.5%	17.5%

Figure 144: Goodness of fit indicators for measured versus simulated data from office building.

9.2.2 K-12 Elementary School.

To expand the capabilities of the emissions calculator, which currently covers office and retail type buildings, K-12 schools were identified as the next largest category of buildings that needed to be included in the emissions reductions calculations. To begin to prepare for this new model, in cooperation with the College Station Independent School District (CSISD), the Laboratory collected representative characteristic shaping data for the school (Figure 145) and then developed a calibrated simulation of the school (Figure 146). Next, a representative shaping model was developed that could be used for an automated school generation (Figure 147 and Figure 148). Finally, actual measured data were gathered from the school to allow for the calibration of the simulation and comparison against the representative model shown in Figure 149, Figure 150, and Figure 151.

Figure 145: Photo of Case Study Elementary School

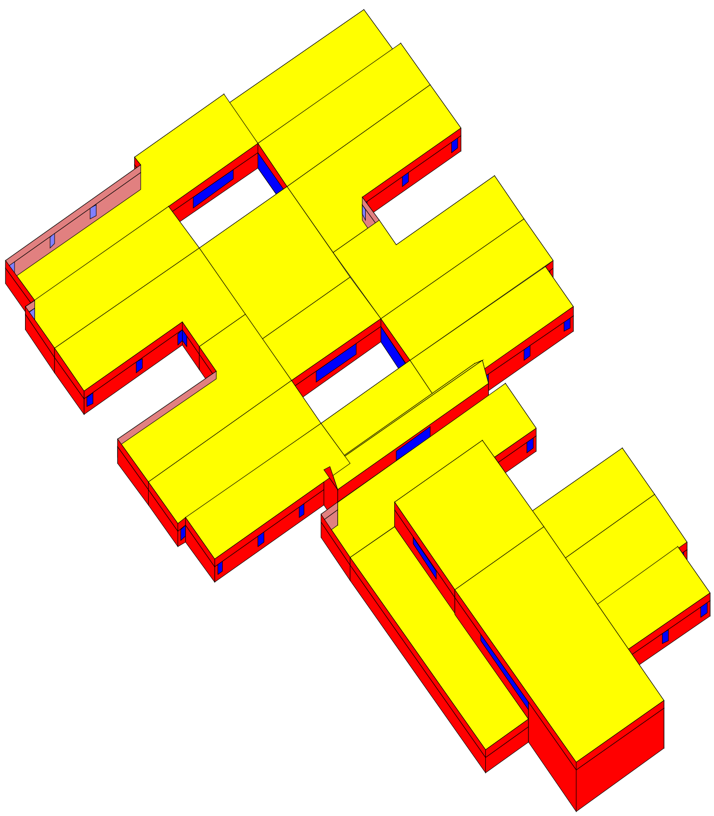


Figure 146: Computer Simulation (DOE-2.1E) of Case Study Elementary School

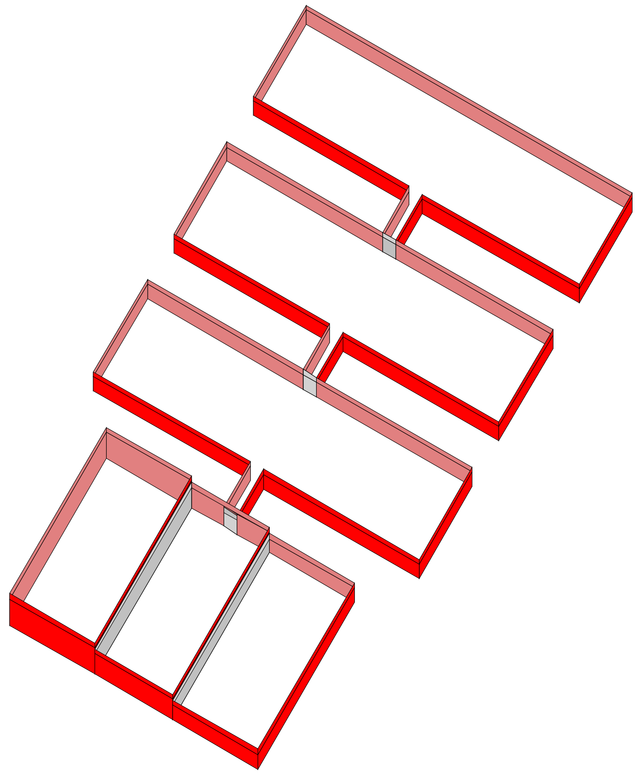


Figure 147: Computer Simulation (DOE-2.1E) of Base Case School Building

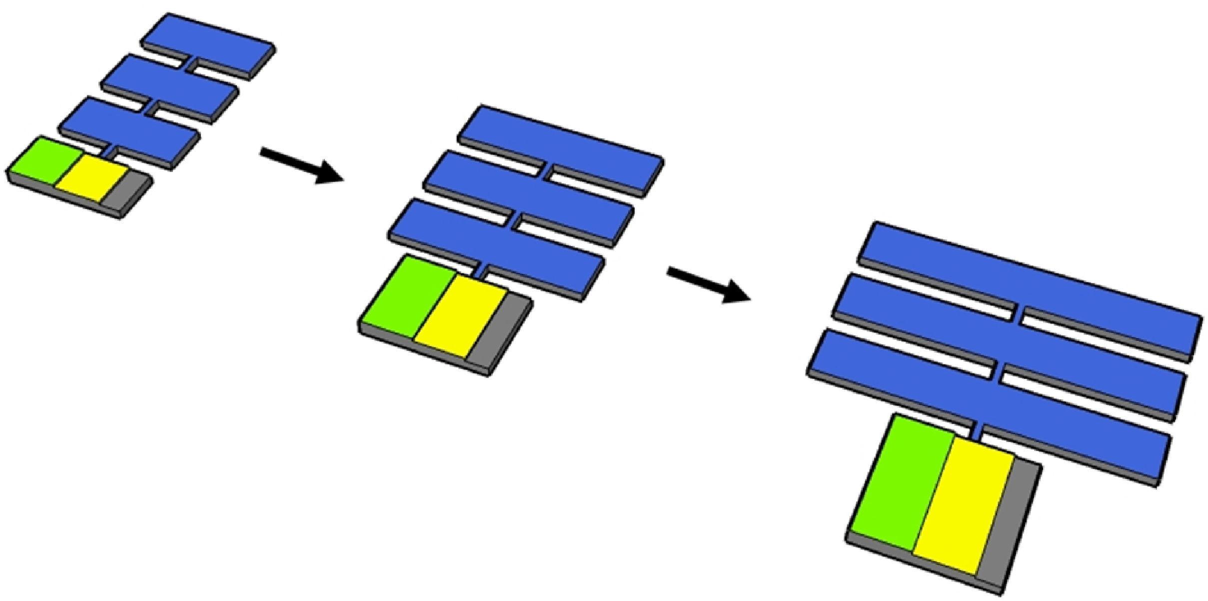


Figure 148: Concept of Base Case School Building

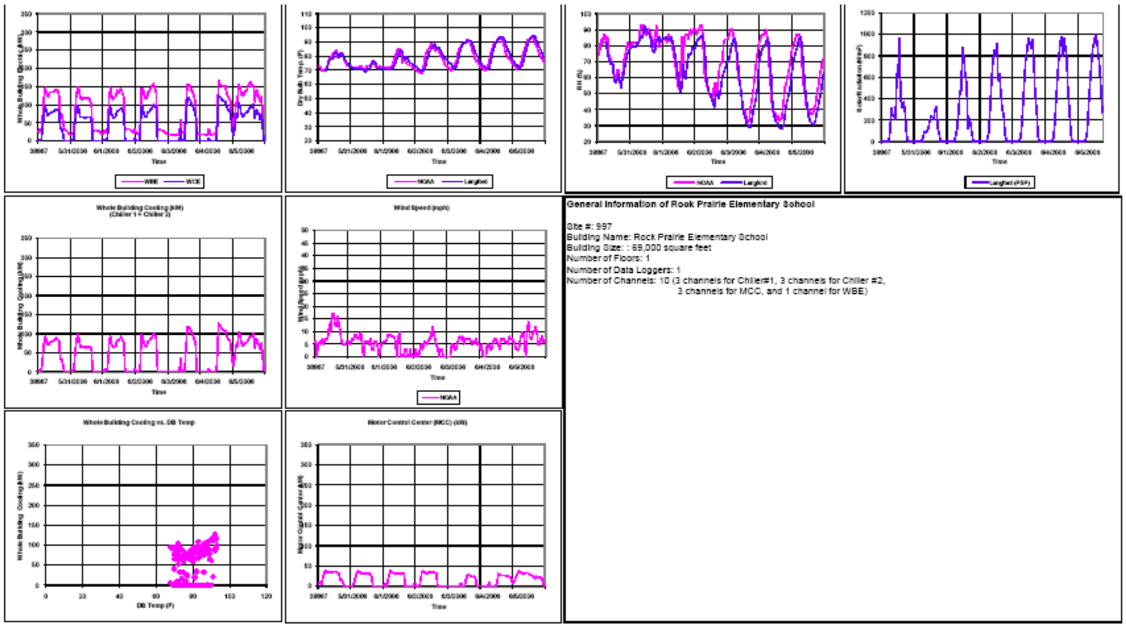


Figure 149: Inspection plots for elementary school.

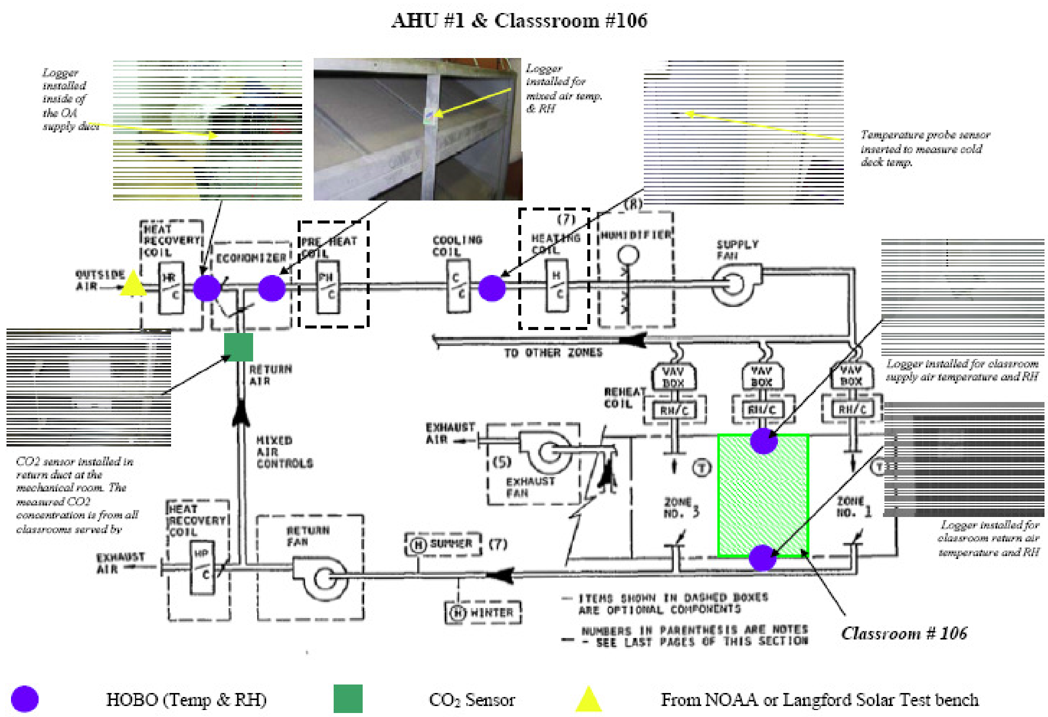
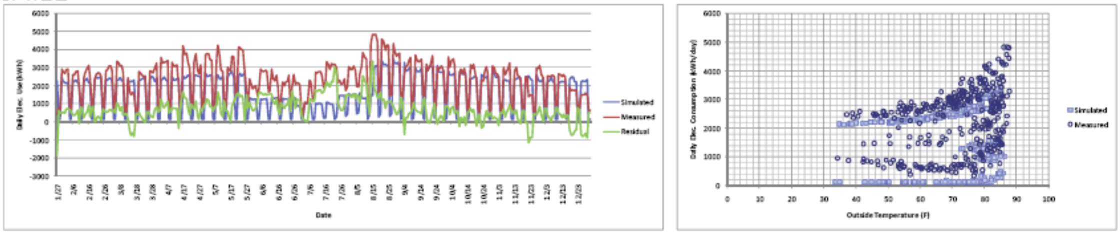


Figure 150: Detailed monitoring diagram for K-12 school.

1. WBE



2. Lighting & Eqipment

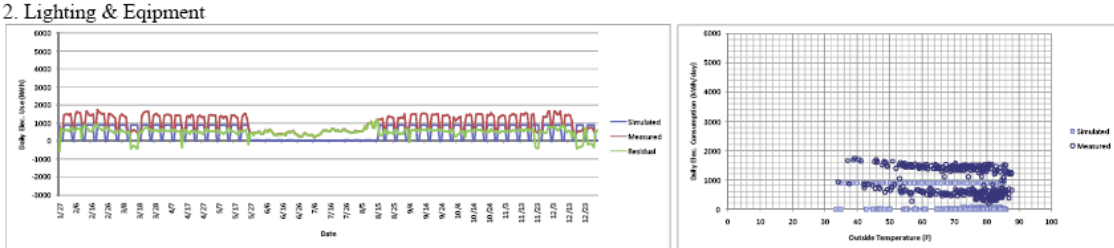


Figure 151: Analysis of data from K-12 school.

9.2.3 Solar Test Bench

In 2007 the Laboratory continued with the monitoring of the data from the Solar Test Bench to accommodate the testing of energy-efficient glazing for purposes of verifying the calibrated simulations. Figure 152 shows photos of the instrumentation at the test bench. Figure 153 and Figure 154 show weekly inspection plots from the solar test bench.

Figure 152: Photos of the Laboratory's Solar Test Bench.

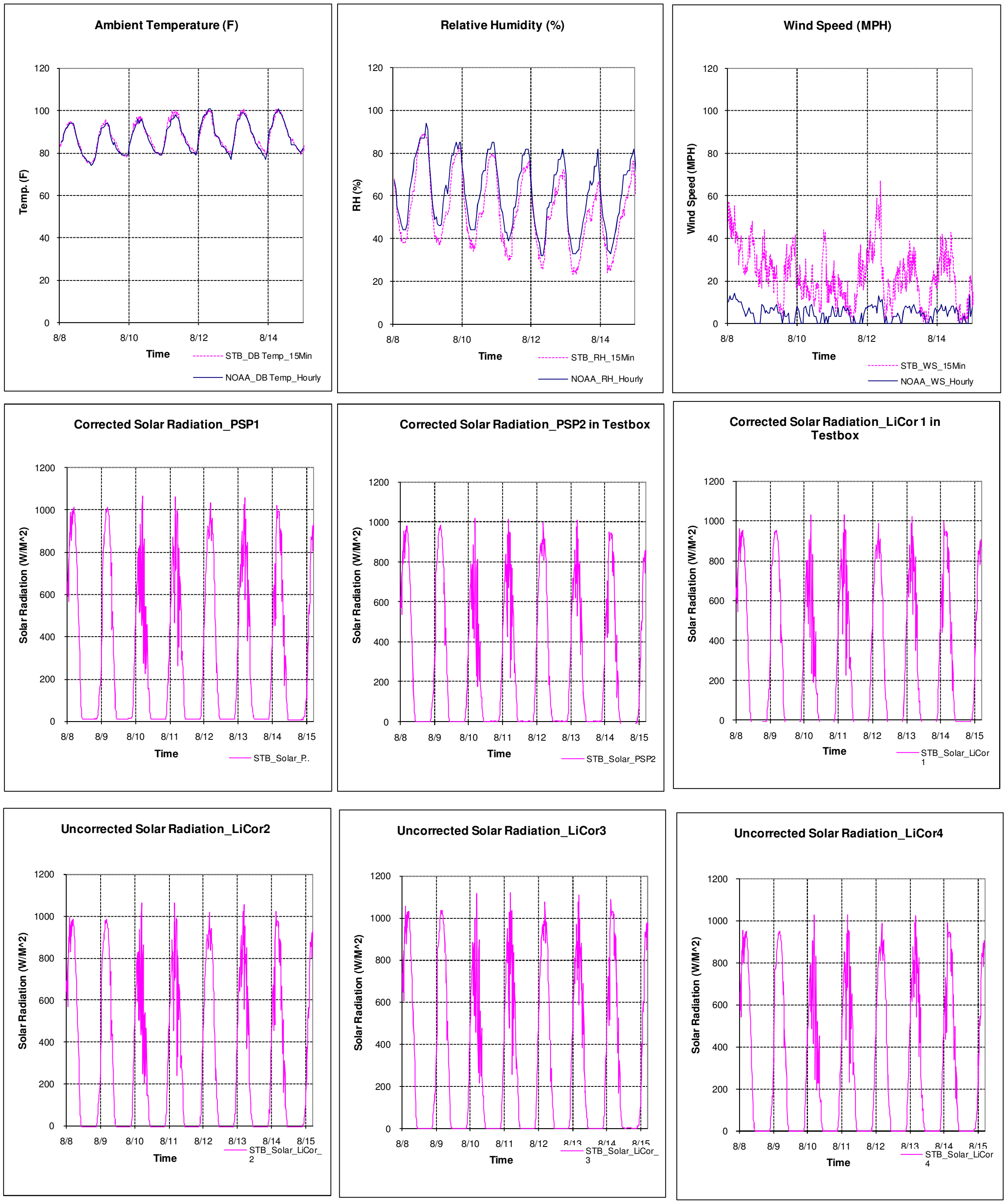
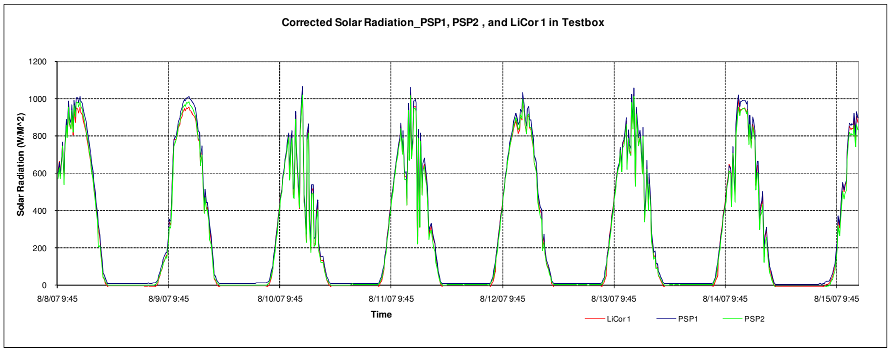
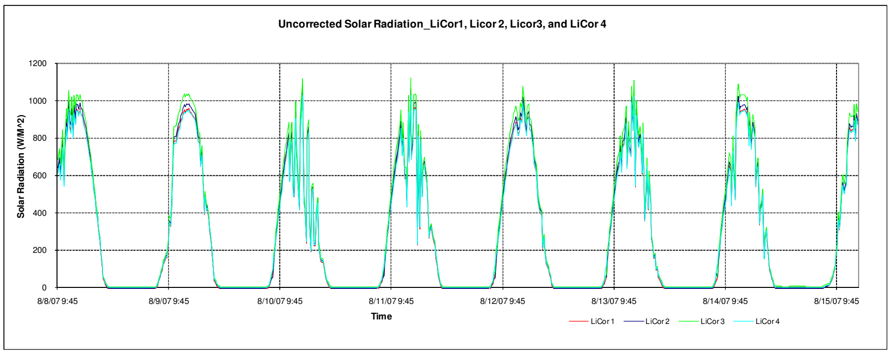


Figure 153: 2007 Weekly Inspection Plots from the Laboratory's Solar Test Bench.





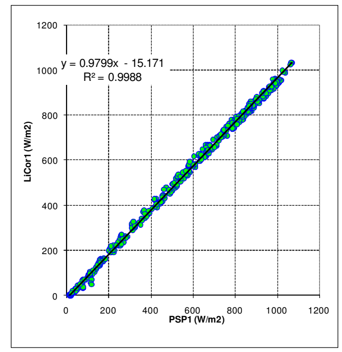


Figure 154: 2007 Weekly Inspection Plots from the Laboratory’s Solar Test Bench.

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